OUR
SCHOOLDAY VISITOR
MATHEMATICAL ALMANAC
AND
ANNUAL.

1871.

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The Answers to the Problems, &c., proposed in this number of the Annual, with complete solutions, will be given in the Annual for next year. See page 31.

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"As silver is worthless compared with gold, so is gold when compared with virtue."

EXPLANATION OF CHARACTERS IN CALENDARS.

Moon's Phases.	
🌑 New Moon.	🌕 Full Moon.
🌓 First Quart.	🌗 Last Quart.

The Twelve Signs of the Zodiac.		
♈ Aries, or Ram.	♌ Leo, or Lion.	♐ Sagittarius, or Bowman.
♉ Taurus, or Bull.	♍ Virgo, or Virgin.	♑ Capricornus, or Goat.
♊ Gemini, or Twins.	♎ Libra, or Balance.	♒ Aquarius, or Waterman.
♋ Cancer, or Crab-fish.	♏ Scorpio, or Scorp.	♓ Pisces, or Fishes.

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Venus (♀) is called the Governing Planet this year.

EMBER DAYS. March 1.—May 31.—September 20.—December 20.

The year 5632 of the Jewish Era commences on September 16th, 1871.
The year 1288 of the Mahommedan Era commences on March 23d, 1871.

The Head and Face ♈ Ram—Aries.

Neck.
Bull—Taurus. ♉
Breast.
Crab-fish—Cancer. ♋
Bowels.
Virgin—Virgo. ♍
Secrets.
Scorpion—Scorpio. ♏
Knees.
Goat—Capricornus. ♑

Arms.
♊ Twins—Gemini.
Heart.
♌ Lion—Leo.
Reins.
♎ Balance—Libra.
Thighs.
♐ Bowman—Sagittarius.
Legs.
♒ Waterman—Aquarius.

The Feet ♓ Fishes—Pisces.

Eclipses of the Year 1871.

There will be four Eclipses this year, two of the Sun and two of the Moon.

The first is a partial Eclipse of the Moon, January 6th, 4 o'clock 16 m. in the evening. The Moon rises at 4 o'clock 42 m. partly eclipsed on the western limb, in the Middle States, and rises at 5 o'clock eclipsed in the Southern States. Ends in the Middle States at 5 o'clock 45 m. and in the Southern States at 5 o'clock 25 m. in the evening.

The second is an annular Eclipse of the Sun, June 17th, 9 o'clock 30 m. in the evening; therefore invisible here; visible on the Indian, North Pacific, South Pacific Ocean and Australia.

The third is a partial Eclipse of the Moon, July 2nd, 8 o'clock 32 m. in the morning; consequently invisible here; visible on the Pacific Ocean.

The fourth is a total Eclipse of the Sun, December 11th, 11 o'clock 8 m. in the evening; invisible here; visible on the Pacific and Indian Ocean, and on the southern part of Asia. The total line will pass through the Indian Ocean and the northern part of Australia and will end near the Equator on the Pacific Ocean.

Astronomical Calculation by LAWRENCE J. IBACH, Sheridan P. O., Lebanon Co., Pa.

Twelve signs are in the heavens set,
To guide the seer upon his way;
The Ram, the Bull, the Twins are three;
The Crabfish and the Lion stray

Beside the Virgin, with the Scales,
The Scorpion and the Archer next,
The Goat, the Waterman, and Fish
Complete the Astronomic text.

OUR SCHOOLDAY VISITOR.

ILLUSTRATED MATHEMATICAL ALMANAC AND ANNUAL.

INTRODUCTION.

It seems not only particularly graceful, but especially necessary that all persons introducing a new thing to the public, be it what it may, should, in as terse a manner as is compatible with politeness, explain their intention, and how they expect to improve or amuse the people by their act. They must not expect to spring into the ring of publication as the painted clown does into the arena of the circus, with the old, hackneyed exclamation of "Here we are again!" and go on with a senseless performance amid the plaudits of a gaping crowd. The time for such book-making is past, and the critical public sit in cold, dispassionate judgment on the offerings of the author or publisher, with an intent to reward, if reward is deserved, or condemn, without mercy, should either of these caterers have mistaken his vocation.

Trusting reliantly to the justice of this public taste, we have ventured upon an experiment in publication never before attempted in this country, nor yet, as we think, in any other—that of a *Mathematical Almanac and Annual.* The word "Mathematical" may frighten some who, not being mathematicians practically, believe they will find in these pages problems of science calculated only for the learned, or puzzles only to be eliminated by such as have studied the occult arts. To such we will only say, Go further than this preface, and you will be convinced that the true mission of science is simplicity, and that "he who runs may read." We can not promise him that, though he may read, he will guess, for we must say, with some sharp philosopher of old, that we can furnish our readers with ideas, but we can not furnish them with brains to understand them. We can promise them, however, that whatever brains they may have will find pleasant work when applied to the pages of this publication, and that it will not be classed among those serials of momentary import; but a work always pleasing, always offering variety, and "not for a day, but for all time." Its pages have been under the editorial supervision of ARTEMAS MARTIN, a man who has no superior in this land as a mathematician, and one who possesses, in an eminent degree, that happy faculty of bringing his work to the simplest understanding. For a long period Mr. Martin has been a contributor to OUR SCHOOLDAY VISITOR, and in that time his contributions have elicited the highest commendation. This volume, though complete and original in itself, we have named the "Visitor Annual," in honor of that Magazine's long and intimate relationship with the educational interests of this country; and its perusal will while away many a happy hour, and appeal to the good taste of the old and young, destroying the illusion labored under by many, that reading for the lad is not reading for the man—to dispel which we have only to look at the successful literature of the age, and see that while it is written ostensibly for the young, it is greedily devoured by the old, sometimes, we regret to say, with a shamefaced pleasure, but nevertheless unmistakable.

To those who wish to look a little deeper than mere amusement, we believe we have catered correspondingly. To the pure mathematician his study is a passion that grows by what it feeds on; and we can readily believe the assertion of a friend who dropped in on us while we were writing this article, and who, though not blessed with much of this world's goods, said: "Had I my choice between the pleasure I derive from the ability to take two square figures and make a cube of them, and the possession of a hundred thousand dollars, I would choose the first."

With these few words for our text, we commend this publication to the world, in full reliance on its appreciation, and its consequent success.

WILL THE NEW YEAR COME TO-NIGHT, MAMMA?

BY CORA M. EAGER.

THIS beautiful poem, which, for touching simplicity and elegant construction, is not surpassed in our language, was originally published in December, 1860, in "Our Schoolday Visitor," and since that time has attained a popularity that marks it "a thing of beauty" and "a joy for ever."

The authoress has passed away from this earth, but her poem will live and touch the hearts of thousands yet unborn. In reverence to her memory, if for no other cause, we feel that it is eminently appropriate to reproduce it in these pages.

WILL the New Year come to-night, mamma? I'm tired of waiting so;
My stocking hung by the chimney side full three long days ago;
I run to peep within the door at early morning light,—
'T is empty still—O say, mamma, will the New Year come to-night?

Will the New Year come to-night, mamma? The snow is on the hill,
And the ice must be two inches thick upon the meadow's rill;
I heard you tell papa, last night, his son must have a sled,
(I did n't mean to hear, mamma,) and a pair of skates, you said.

I prayed for just these very things, mamma, O, I shall be full of glee,
And the orphan boys in the village school will all be envying me;
But I'll give them toys, and lend them books, and make their New Year glad,
For God, you say, takes back his gifts when little folks are bad.

And won't you let me go, mamma, upon the New Year's day,
And carry something nice and warm to poor old Widow Gray?
I 'll leave the basket near the door, within the garden gate.
Will the New Year come to-night, mamma? It seems so long to wait!

* * * * * * * *

The New Year comes to-night, mamma—I saw it in my sleep;
My stocking hung so full, I thought—mamma, what makes you weep?
But it only held a little shroud—a shroud, and nothing more;
And an open coffin, made for me, was standing on the floor!

It seemed so very strange, indeed, to find *such* gifts instead
Of all the toys I wished so much—the story books and sled;
But while I wondered what it meant, you came with tearful joy,
And said "Thou 'lt find the New Year first. God calleth thee, my boy!"

It is not all a dream, mamma—I know it must be true;
But have I been so bad a boy, God taketh me from you?
I do n't know what papa will do when I am laid to rest,
And you will have no Willie's head to fold upon your breast.

The New Year comes to-night, mamma—your cold hand on my cheek,
And raise my head a little more—it seems so hard to speak;
You need n't fill my stocking now, I can not go and peep,—
Before the morrow's sun is up, I 'll be so sound asleep.

I shall not want the skates, mamma, I 'll never need the sled;
But wo n't you give them both to Blake, who hurt me on the head?
He used to hide my books away, and tear the pictures, too;
But now he 'll know that I forgive, as then I tried to do.

And, if you please, mamma, I 'd like the story books and slate
To go to Frank, the drunkard's boy, you would n't let me hate;
And, dear mamma, you wo n't forget, upon the New Year's day,
The basketful of something nice for poor old Widow Gray.

The New Year comes to night, mamma—it seems so very soon—
I think God did n't hear me ask for just another June;
I know I 've been a thoughtless boy, and made you too much care,
And may be, for your sake, mamma, He does n't hear my prayer.

There 's one thing more; my pretty pets, the robin and the dove,
O, keep for you and dear papa, and teach them how to love;
The garden rake, the little hoe—you 'll find them nicely laid
Upon the garret floor, mamma, the place where last I played.

I thought to need them both so much when summer comes again,
To make my garden by the brook that trickles through the glen;
I thought to gather flowers, too, beside the forest walk,
And sit beneath the apple tree where once we sat to talk.

It can not be; but you will keep the summer flowers green,
And plant a few—do n't cry, mamma—a very few, I mean,
Where I 'm asleep. I 'd sleep so sweet beneath the apple tree,
Where you and robin, in the morn, may come and sing to me.

The New Year comes—good night, mamma—"I lay me down to sleep,
I pray the Lord"—tell poor papa—"my soul to keep;
If I"—how cold it seems! how dark!—kiss me, I can not see;
The New Year comes to-night, mamma, the old year—dies with me.

REMARKABLE MEMORIES.

MAGLIBECCHI, the founder of the great library at Florence, had so wonderful a memory that Gibbon styled him "memory personified." At one period of his life Seneca could repeat two thousand words precisely as they had been pronounced. Gassendi had acquired by heart six thousand Latin verses, and in order to give his memory exercise, he was in the habit of daily reciting six hundred verses from different languages. Saunderson, another mathematician, could repeat all Horace's odes, and a great part of the Latin authors. La Croze, after listening to twelve verses in as many languages, could not only repeat them in the order in which he heard them, but could also transpose them. Pope had an excellent memory, and many persons have amused themselves by looking through his writings and pointing out how often he had brought it into play. He was able to turn with great readiness to the precise place in a book where he had seen any passage that struck him. John Lynden had a very peculiar faculty for getting things by rote, and he could repeat correctly any long, dry document, such as a deed or act of Parliament, after having heard it read; but if he wanted any single paragraph, he was obliged to begin at the commencement, and proceed with his recital until he came to what he required. There was a French novelist, who, being a printer, composed a volume in type, and thus the book was printed without having been written. Bishop Warburton bad a prodigious memory, which he taxed to an extraordinary degree. His "Divine Legation" would lead one to suppose that he had indefatigably collected and noted down the innumerable facts and quotations there introduced; but the fact is that his only note-book was an old almanac, in which he occasionally jotted down a thought. Scaliger obtained so perfect a knowledge of one Latin book, that he offered to repeat any passage with a dagger at his breast, to be used against him in case of a failure of memory.

◆

PEOPLE who are always trying to be brilliant, whether in books or in real life, have a singularly exasperating effect. You can bear honest dullness a great deal better than this fireworks style, which keeps your attention constantly on the *qui vive* lest you miss something you are expected to appreciate and admire. One of the most disagreeable men to be encountered any where is a habitual punster, whose self-love is wounded if you do not see all his points as quickly as he makes them.

"The first use of wisdom is to correct our own faults."

JANUARY. Calculated for North, East, South and West. 1871.

W. & D.	Month, Days, &c.	Latitude of Southern States. SUN rises	SUN sets	MOON r. & s.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises	SUN sets	MOON r. & s.	S. slow	Moon's Signs. s.	d.	Moon south.	High Water. Phila.
		h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m.	s.	d.	h. m.	h. m.
1)	**New Year.**				**Matt. 2.**	**Day's length**	**9 h. 42 m. South. States.** **9 h. 14 m. Middle States.**						
S.	1 *New Year*	7 9	4 51	1 42	☽ in Apogee. ◡	7 23	4 37	1 50	4	♉	5	8 8	10 13
M.	2 Abel, Seth	7 8	4 52	2 46	⊙ in Perigee.	7 23	4 37	2 54	4	♉	17	8 50	11 10
T.	3 Enoch	7 8	4 52	3 50	♂ rises 11 h. 30 m.	7 23	4 37	3 56	5	♊	0	9 36	12 4
W.	4 Methusal.	7 8	4 52	4 52	☌ ☽ ♃ ♃ so. 10, 20.	7 22	4 38	4 59	5	♊	13	10 27	12 46
T.	5 Simon	7 7	4 53	5 54	○ ☊ Sir. so. 11,36. ◠	7 22	4 38	6 2	6	♊	26	11 24	1 26
F.	6 *Epiphany*	7 7	4 53	rises.	**6.** Orion 10, 40.	7 21	4 39	rises.	6	♋	9	morn.	2 5
S.	7 Isidor	7 7	4 53	5 41	☌ ☽ ♅ Rigel so. 9,49.	7 21	4 39	5 29	6	♋	23	1 10	2 44
2)	**1. Sunday after Epiphany.**				**Luke 2.**	**Day's length**	**9 h. 48 m. South. States.** **9 h. 20 m. Middle States.**						
S.	8 Erhard	7 6	4 54	6 36	☿ Stationary.	7 20	4 40	6 24	7	♌	7	1 58	3 19
M.	9 Julian	7 6	4 54	7 42	□ Neptun ⊙	7 20	4 40	7 34	7	♌	21	2 44	3 54
T.	10 *Paul's im.*	7 5	4 55	8 56	♀ in Aphelion.	7 19	4 41	8 49	8	♍	6	3 36	4 30
W.	11 Eugene	7 4	4 56	10 5	♃ south 10 h. 8 m.	7 19	4 41	9 59	8	♍	20	4 22	5 12
T.	12 Rinehold	7 3	4 57	11 15	☌ ☽ ♂ ♂ rises 11, 9.	7 18	4 42	11 11	9	♎	5	5 12	5 54
F.	13 Hilary	7 3	4 57	morn.	☾ ♄ ☿ ♀	7 17	4 43	morn.	9	♎	19	6 0	6 38
S.	14 Felix	7 2	4 58	12 14	**14.** ☍ ♅ ⊙	7 17	4 43	12 18	9	♏	3	6 52	7 28
3)	**2. Sunday after Epiphany.**				**John 2.**	**Day's length**	**9 h. 58 m. South. States.** **9 h. 28 m. Middle States.**						
S.	15 Maurice	7 1	4 59	1 18	7* south 7 h. 53 m.	7 16	4 44	1 24	10	♏	17	7 44	8 31
M.	16 Marcellus	7 0	5 0	2 28	Capella south 9, 12.	7 15	4 45	2 35	10	♐	1	8 39	9 40
T.	17 Anthony	7 0	5 0	3 40	☌ ☿ ⊙ Inferior.	7 14	4 46	3 46	10	♐	14	9 29	10 52
W.	18 *Franklin*	6 59	5 1	4 51	☽ in Perigee. ◡	7 13	4 47	4 58	11	♐	28	10 20	11 46
T.	19 Sarah	6 58	5 2	5 56	☋ ♄ rises 5, 20. mor.	7 12	4 48	6 1	11	♑	11	11 10	12 39
F.	20 Fab. Seb.	6 58	5 2	sets.	● **20.** ⊙ Ent. ♒	7 12	4 48	sets.	11	♑	24	11 42	1 36
S.	21 Agnes	6 57	5 3	5 52	♀ sets 5 h. 41 m.	7 11	4 49	5 40	12	♒	6	12 40	2 26
4)	**3. Sunday after Epiphany.**				**Matt. 8.**	**Day's length**	**10 h. 8 m. South. States.** **9 h. 40 m. Middle States.**						
S.	22 Vincent	6 56	5 4	6 42	♃ south 9 h. 40 m.	7 10	4 50	6 32	12	♒	19	1 36	3 15
M.	23 Charitas	6 55	5 5	7 30	Regulus rises 6, 57.	7 9	4 51	7 22	12	♓	1	2 27	3 55
T.	24 Timothy	6 55	5 5	8 24	Sirius south 10, 13.	7 8	4 52	8 18	12	♓	13	3 16	4 38
W.	25 *Paul's c.*	6 54	5 6	9 20	Orion south 9, 14.	7 7	4 53	9 15	13	♓	25	4 1	5 19
T.	26 Polycarpus	6 53	5 7	10 15	♂ rises 10 h. 29 m.	7 6	4 54	10 12	13	♈	7	4 44	5 58
F.	27 J. Chrysos.	6 53	5 7	11 10	☽ ♀ sets 5 h. 56 m.	7 5	4 55	11 6	13	♈	19	5 24	6 36
S.	28 Charles	6 52	5 8	morn.	**28.** ♄ rises 4,44.	7 4	4 56	morn.	13	♉	1	6 6	7 15
5)	**4. Sunday after Epiphany.**				**Matt. 8.**	**Day's length**	**10 h. 18 m. South. States.** **9 h. 54 m. Middle States.**						
S.	29 Valerius	6 51	5 9	12 0	☽ in Apo. ☿ Station.	7 3	4 57	12 0	13	♉	13	6 48	8 4
M.	30 Adelgunda	6 51	5 9	12 56	Arctur rises 10, 3.	7 2	4 58	1 2	14	♉	25	7 34	9 7
T.	31 Virgil	6 50	5 10	1 54	☽ ♄ ♃ ♃ south 9, 2.	7 1	4 59	2 5	14	♊	8	8 22	10 21

5631. 3. Fast of Thebet. 23. Rosh Hodesh Shebat.

Moon's Phases.

Southern States.

	dy.	h.	m.
Full Moon	6	4	0 Ev.
Last Quarter	14	1	39 Mo.
New Moon	20	7	2 Ev.
First Quarter	28	7	43 Mo.

Middle States.

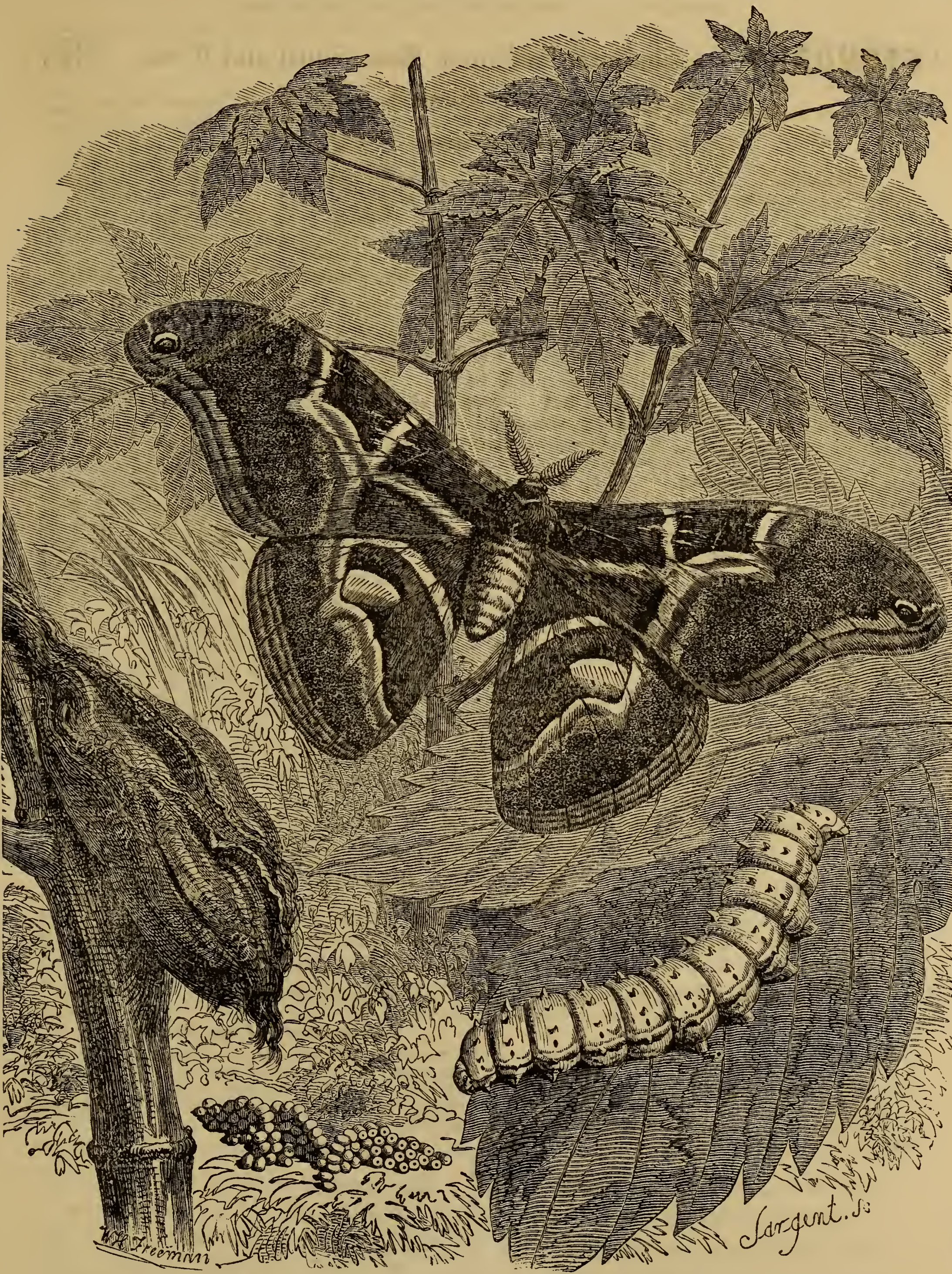
	dy.	h.	m.
Full Moon	6	4	17 Ev.
Last Quarter	14	1	47 Mo.
New Moon	20	7	20 Ev.
First Quarter	28	8	2 Mo.

Conjectures of the Weather.

The 1, 2, 3, changeable; 4, 5, 6, cold and stormy; 7, 8, 9, snow and rain; 10, 11, 12, fair; 14, 15, 16, changeable; 17, 18, 19, 20, windy, cold and snow; 22, 23, 24, fair; 25 up to the end of the month cold, stormy, snow and rain.

The icy breath of wintry winds
Congeals the river's glassy breast,
And with the opening of the year
The world puts on its snowy vest.

The jovial skater wings his way
Along the frozen pond or stream,
And merry sleighbells fill the air
With music, like a pleasant dream.



THE CATERPILLAR, CHRYSALIS, PERFECT INSECT AND EGGS OF THE S. CYNTHIA MOTH.

"Beauty without virtue is like a flower without perfume."

FEBRUARY. Calculated for North, East, South and West. 1871.

W. & D.	Month. Days, &c.		Latitude of Southern States.			Aspects of Planets and other Miscellanies.	Latitude of Middle States.			S. slow	Moon's Signs.		Moon south.	High Water. Phila.
			SUN rises & sets.		MOON r. & s.		SUN rises & sets.		MOON r. & s.					
			h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m.	s.	d.	h. m.	h. m.
W.	1	Virginia	6 49	5 11	3 0	♂ rises 10 h. 11 m. ◡	7 0	5 0	3 6	14	♊	20	9 10	11 34
T.	2	*Candle M.*	6 49	5 11	4 0	♀ gr. Hel. Lat. so. ◠	6 59	5 1	4 4	14	♋	4	10 2	12 7
F.	3	Blasius	6 48	5 12	4 57	☌ ☽ ♅ ♄ rises 4, 20.	6 58	5 2	5 2	14	♋	17	10 52	1 3
S.	4	Veronica	6 47	5 13	5 52	☊ ♀ sets 6 h. 2 m.	6 57	5 3	5 59	14	♌	1	11 48	1 45
6)	**Septuagesima Sunday.**					**Matt. 20.**	**Day's length**				**10 h. 28 m. South. States.** **10 h. 8 m. Middle States.**			
S.	5	Agathe	6 46	5 14	rises.	🌕 **5.** ♃ so. 8, 31.	6 56	5 4	rises.	14	♌	16	morn.	2 22
M.	6	Dorothy	6 45	5 15	6 41	Sirius so 9, 21.	6 54	5 6	6 33	14	♍	0	12 31	3 6
T.	7	Richard	6 44	5 16	7 46	Orion so. 8 h. 24 m.	6 53	5 7	7 40	14	♍	15	2 20	3 40
W.	8	Solomon	6 43	5 17	8 35	♄ rises 3 h. 49 m.	6 52	5 8	8 30	15	♎	0	3 8	4 17
T.	9	Apollonia	6 42	5 18	9 39	☌ ☽ ♂ ♂ rises 9, 49.	6 51	5 9	9 54	15	♎	15	3 58	4 54
F.	10	Scholastica	6 41	5 19	10 59	♃ Stationary.	6 50	5 10	10 56	15	♎	29	4 46	5 32
S.	11	Euphrosin.	6 40	5 20	11 59	Antares rises 3 h. 17 m.	6 48	5 12	11 59	15	♏	14	5 38	6 14
7)	**Sexagesima Sunday.**					**Luke 8.**	**Day's length**				**10 h. 42 m. South. States.** **10 h. 26 m. Middle States.**			
S.	12	Gilbert	6 39	5 21	morn.	🌗 **12.** ♀ sets 6, 12.	6 47	5 13	morn.	15	♏	28	6 32	7 1
M.	13	Jordan	6 38	5 22	12 43	☽ in Perigee.	6 46	5 14	12 46	15	♐	11	7 29	7 56
T.	14	*Valentine*	6 37	5 23	1 38	♃ south 7 h. 41 m.	6 45	5 15	1 42	14	♐	24	8 26	9 10
W.	15	Faustine	6 36	5 24	2 34	☌ ☽ ♄ ♄ r. 3, 20. ◡	6 44	5 16	2 40	14	♑	7	9 24	10 33
T.	16	Julianus	6 35	5 25	3 39	Andromeda sets 9, 50.	6 42	5 18	3 44	14	♑	20	10 20	11 56
F.	17	Constantin	6 34	5 26	4 44	☌ ☽ ☿ ☿ rises 5, 6.	6 41	5 19	4 50	14	♒	3	10 59	12 33
S.	18	Concordia	6 33	5 27	5 53	☋ ♂ rises 9 h. 27 m.	6 40	5 20	5 58	14	♒	15	11 40	1 31
8)	**Quinquagesima Sunday.**					**Luke 18.**	**Day's length**				**10 h. 56 m. South. States.** **10 h. 42 m. Middle States.**			
S.	19	Susanna	6 32	5 28	sets.	🌑 **19.** ☉ enters ♅	6 39	5 21	sets.	14	♒	29	12 16	2 18
M.	20	Eucharius	6 31	5 29	6 26	♀ sets 6 h. 24 m.	6 38	5 22	6 20	14	♓	10	1 6	3 4
T.	21	*Shrove T.*	6 30	5 30	7 19	Arctur rises 8 h. 40 m.	6 37	5 23	7 14	14	♓	22	1 51	3 42
W.	22	*Ash Wedn.*	6 29	5 31	8 15	Orion south 7 h. 26 m.	6 35	5 25	8 10	14	♈	4	2 36	4 16
T.	23	Serenus	6 28	5 32	9 9	☿ in Aphelion.	6 34	5 26	9 4	14	♈	16	3 20	4 50
F.	24	*St. Matth.*	6 27	5 33	9 59	♄ rises 2 h. 49 m.	6 32	5 28	9 59	14	♈	28	4 4	5 21
S.	25	Victor	6 26	5 34	10 39	♂ rises 9 h. 0 m.	6 31	5 29	10 37	13	♉	9	4 46	5 57
9)	**1. Sunday in Lent.**					**Matt. 4.**	**Day's length**				**11 h. 10 m. South. States.** **11 h. 00 m. Middle States.**			
S.	26	Nestor	6 25	5 35	11 56	🌓 ☽ in Apogee.	6 30	5 30	11 54	13	♉	21	5 28	6 31
M.	27	Leander	6 24	5 36	morn.	**27.** ☌ ☽ ♃	6 28	5 32	morn.	13	♊	3	6 10	7 9
T.	28	Macarius	6 23	5 37	12 50	Sirius so. 7 h. 54 m.	6 27	5 33	12 53	13	♊	16	7 4	8 1

5631. 6. Rosh Shanah Leaylanot. 21. 22. Rosh Hodesh Adar.

Moon's Phases.

Southern States.

	dy.	h.	m.	
Full Moon	5	8	29	Mo.
Last Quarter	12	10	28	Mo.
New Moon	19	8	16	Mo.
First Quarter	27	5	7	Mo.

Middle States.

	dy.	h.	m.	
Full Moon	5	8	47	Mo.
Last Quarter	12	10	46	Mo.
New Moon	19	8	34	Mo.
First Quarter	27	5	25	Mo.

Conjectures of the Weather.

The 1, 2, 3, 4, cold and clear; 5, 6, changeable; 7, 8, 9, cold and windy; 10, 11, 12, stormy with snow; 13, 14, 15, clear and cold; 16, 17, 18, changeable; 19, 20, clear; 21, 22, 23, cloudy, snow or rain; 24 up to the end of the month clear and cold.

With February's softening breath
Comes Cupid and his screed of love,
And heralding the opening spring,
The skies grow brighter up above.

The modest violet in the wood
Now struggles with the melting snow,
And, warming to the genial sun,
The peeping grass begins to grow.

THE SILKWORM.

BY UNCLE SAMUEL.

THE illustration which precedes this article is designed to represent the eggs, the Caterpillar, the Chrysalis, and perfect insect of the Cynthia Moth, known in the East Indies as the Arrindy Silkworm, and in this country as the Ailanthus Silkworm. Before proceeding to speak of this silkworm, I will trace briefly the history of the silk trade, and notice the causes which led to experiments in the culture of the Cynthia worm in Europe and in this country.

The Silkworm of commerce is known as the *Bombyx Mori*—the specific name being derived from *Morus*, the Latin word for the mulberry tree, on the leaf of which it feeds. Its native country was probably China, since in that country the manufacture of silk was first known. It is said that the cocoon of this moth was first unwound and spun into threads by the Empress of China 2600 years before Christ. Up to the date of this discovery the skins of animals were used for clothes by the Celestials. But these proving no longer sufficient for the multitude of inhabitants, the necessities of the ever-increasing population stimulated industry and inspired genius to devise some new material for clothing purposes, and the empresses and honorable women devoted themselves to the rearing of silkworms, and in making and in weaving silk.

When silk fabrics became staple articles of commerce, the Chinese forbid, under pain of death, the exportation of silkworms' eggs, or the furnishing of the information necessary to the obtaining of the textile material. Thus the whole world was dependent upon China for silk products, and consequently for centuries their price was fabulously high. In the time of Alexander the Great, silk was sold readily in Greece for exactly its own weight in gold.

Before the age of Julius Cæsar, silk was unknown to the Romans. And for many years after its use was introduced in Greece and Rome, writers generally, with the exception of Aristotle and Pliny, regarded it as a vegetable product. These authors alone asserted that it was the work of a caterpillar. For more than 500 years after Christ, the trade in silk was carried on exclusively by means of Persian caravans, which brought silk across the plains of Asia into Europe.

About the year 530, while Justinian I. was Emperor of Constantinople, two monks of the order of St. Basil went on a mission to China. While there, they acquired a knowledge of all the operations necessary to the production of this much coveted material. Securing a quantity of silkworms' eggs in hollow reeds, they returned to Constantinople with their precious booty. From this small beginning the culture of silk took its rise in Constantinople.

In a short time, from the manufactories here established, and from others in Greece, all Europe was supplied, for centuries, with silkworms and silk. But the diffusion was exceedingly slow. And it was not till 1423 that the mulberry was cultivated in Tuscany. And in 1473 we find the commerce in silken goods with all parts of the world, exceedingly prosperous at Florence.

In 1340 the first mulberry trees were planted in Avignon, in France. From that date till the first part of the nineteenth century, the silk culture in France experienced many reverses, and made but little progress. In 1808 it was revived, and ever since it has been steadily advancing in importance in that country.

It was not till 1718 that the manufacture of organzine silk thread was introduced in England, and large silk factories were constructed. In 1824, when the tariff restrictions which were designed to protect these factories were to a great extent removed, and foreign silks were introduced, the inventive genius of English operatives was stimulated, machinery was improved, and processes simplified, and an increased amount and a better quality of fabric was produced.

There have been several attempts to raise and manufacture silk in the United States. But these attempts have only demonstrated that, in this country, industry is much more productive in other directions; or, at least, the raising of the *Bombyx Mori* is not attended with sufficient success to make it profitable. Hence it is that at present there is no silk factory of any importance in the States.

The introduction of a disease among the *Bombyx Mori* in England and France, and the difficulties attending the silk culture in this country, have induced silk raisers to turn their attention to the domestication of the Cynthia Silkworm.

This moth is said, by some, to be a native of India, and by others to be indigenous to Japan. It was introduced into France in 1858, and in

"The wisest man, in general, is he who does not think he is so."

MARCH. Calculated for North, East, South and West. 1871.

W. & D.		Month, Days, &c.	Latitude of Southern States. SUN rises & sets.		MOON r. & s.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises & sets.		MOON r. & s.	S. slow	Moon's Signs.		Moon south.	High Water. Phila.
			h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m	s.	d.	h. m.	h. m.
W.	1	*Emberday*	6 22	5 38	1 54	♀ sets 6 h. 59 m. ∩	6 26	5 34	1 56	13	♊	29	7 54	9 12
T.	2	Simplicius	6 21	5 39	2 59	☌ ☽ ♅ ☊ ♄ rises 2,39.	6 24	5 36	2 59	12	♋	12	8 44	10 38
F.	3	Samuel	6 19	5 41	4 0	Arctur rises 8 h. 4 m.	6 23	5 37	4 2	12	♋	25	9 39	11 56
S.	4	Adrian	6 18	5 42	4 58	Regulus south 11, 2.	6 22	5 38	5 1	12	♌	9	10 28	12 34
10)		2. Sunday in Lent.				Matt. 15.	Day's length { 11 h. 26 m. South. States. 11 h. 20 m. Middle States.							
S.	5	Frederick	6 17	5 43	5 57	○ Spica so. 8, 48.	6 20	5 40	6 0	12	♌	24	11 20	1 22
M.	6	Fridolin	6 16	5 44	g. a.	**6**. Sirius so. 7,30.	6 19	5 41	rises.	12	♍	9	morn.	2 4
T.	7	Perpetua	6 15	5 45	7 25	♄ rises 2 h. 29 m.	6 18	5 42	7 23	11	♍	24	12 31	2 40
W.	8	Philemon	6 14	5 46	8 39	□ ♃ ☉ ♂ rises 8, 24.	6 17	5 43	8 37	11	♎	9	1 40	3 16
T.	9	Prudence	6 13	5 47	9 51	♀ sets 7 h. 21 m.	6 15	5 45	9 49	11	♎	24	2 50	3 56
F.	10	Apolonius	6 11	5 49	10 58	☽ in Perigee.	6 14	5 46	10 56	11	♏	9	3 42	4 34
S.	11	Ernestus	6 10	5 50	11 59	Rigel sets 11 h. 12 m.	6 12	5 48	11 59	10	♏	24	4 36	5 12
11)		3. Sunday in Lent.				Luke 11.	Day's length { 11 h. 42 m. South. States. 11 h. 38 m. Middle States.							
S.	12	Gregory	6 9	5 51	morn.	☾ Regulus so. 10, 32	6 11	5 49	morn.	10	♐	9	5 28	5 52
M.	13	Macedon	6 8	5 52	12 48	**13**. Or. so. 6, 14.	6 10	5 50	12 50	10	♐	22	6 24	6 40
T.	14	Zachariah	6 7	5 53	1 44	♄ rises 2 h. 20 m. ∪	6 8	5 52	1 45	10	♑	5	7 24	7 33
W.	15	Christophe	6 6	5 54	2 39	☋ Wega rises 10, 7.	6 7	5 53	2 40	9	♑	19	8 22	8 49
T.	16	Cyprianus	6 5	5 55	3 32	☿ gr. Hel. Lat. So.	6 6	5 54	3 34	9	♒	4	9 20	10 23
F.	17	*St. Patrick*	6 3	5 57	4 25	♀ sets 7 h. 38 m.	6 4	5 56	4 26	9	♒	19	10 10	11 42
S.	18	Anshelmus	6 2	5 58	5 7	♃ sets 11 h. 38 m.	6 3	5 57	5 8	8	♓	4	11 40	12 30
12)		4. Sunday in Lent.				John 6.	Day's length { 11 h. 58 m. South. States. 11 h. 58 m. Middle States.							
S.	19	Joseph	6 1	5 59	5 40	● ☍ ♂ ☉	6 1	5 59	5 41	8	♓	19	11 20	1 23
M.	20	Matrona	6 0	6 0	sets.	**20**. ☉ ent. ♈	6 0	6 0	sets.	8	♈	2	11 52	2 8
T.	21	Benedict	5 59	6 1	6 40	D.&N. eq. *spring com.*	5 58	6 2	6 50	7	♈	16	12 30	2 44
W.	22	Paulina	5 58	6 2	7 43	♀ sets 7 h. 49 m.	5 57	6 3	7 44	7	♈	28	1 12	3 19
T.	23	Everad	5 57	6 3	8 36	♄ rises 1 h. 28 m.	5 56	6 4	8 38	7	♉	10	1 58	3 50
F.	24	Gabriel	5 56	6 4	9 29	Sirius south 6 h. 26 m.	5 55	6 5	9 31	7	♉	22	2 40	4 22
S.	25	*An. B. V. M.*	5 54	6 6	10 20	7* sets 10 h. 52 m.	5 54	6 6	10 22	6	♊	3	3 24	4 52
13)		5. Sunday in Lent.				John 8.	Day's length { 12 h. 14 m. South. States. 12 h. 16 m. Middle States.							
S.	26	Emanuel	5 53	6 7	11 16	☽ in Apogee.	5 53	6 8	11 18	6	♊	14	4 8	5 20
M.	27	Gustavus	5 52	6 8	11 57	♃ sets 11 h. 25 m. ∩	5 52	6 9	11 59	6	♊	26	4 56	5 54
T.	28	Gideon	5 51	6 9	morn.	☽ ☌ ☿ ☉ Superior.	5 50	6 10	morn.	5	♋	8	5 44	6 30
W.	29	Eustasius	5 50	6 10	11 57	**29**. ☊	5 49	6 11	11 55	5	♋	21	6 36	7 17
T.	30	Guido	5 49	6 11	1 52	☌ ☽ ♅ □ ♄ ☉	5 48	6 12	1 50	5	♌	3	7 25	8 29
F.	31	Detlaus	5 48	6 12	2 4	♅ Stationary.	5 47	6 13	2 40	4	♌	17	8 18	9 54

5531. 6. Fast of Esther. 7. 8. Purim. 23. Rosh Hodesh Nissan.

Moon's Phases.

SOUTHERN STATES.	dy.	h.	m.		MIDDLE STATES.	dy.	h.	m.	
Full Moon	6	10	8	Ev.	Full Moon	6	10	26	Ev.
Last Quarter	13	4	52	Aft.	Last Quarter	13	5	10	Aft.
New Moon	20	10	32	Ev.	New Moon	20	10	50	Ev.
First Quarter	29	1	22	Mo.	First Quarter	29	1	40	Mo.

Conjectures of the Weather.

The 1, 2, 3, 4, cold and windy; 5, 6, 7, cloudy, sometimes clear; 8, 9, 10, fair; 11, 12, 13, disagreeable; 14, 15, 16, clear and cold: 17, rain and snow: 18, 19, agreeable; 20, 21, 22, rough winds; 23, 24, 25, pleasant; 26, 27, changeable: 28, 29, clear· 30, 31, stormy.

Next March, the farmer's hopeful time,
When mother earth receives her seed,
To give it back a hundred fold,
To meet the farmer's urgent need.

The woods and fields awake to life,
With song of birds the air is gay,
And now, released from icy bonds,
The streams go singing on their way.

that year the first moths were presented to the Academy of Sciences of Paris. Experiments soon demonstrated that the caterpillar of this moth could be raised in the open air; that two broods could be produced in a year; and that the Ailanthus, on which this insect feeds, could with great ease be raised on the most sterile soil.

The cheapness at which this silk can be produced, and its great durableness, though inferior to the silk of commerce in richness and fineness, make its culture desirable. The Orientals, who have long used the Arrindy silk, card the cocoons and get a kind of floss silk, which they weave into a texture coarser and looser than the silk of the mulberry worm; but which, on being washed and beaten well, is made very soft and pliable. It will wear constantly ten, fifteen, or twenty years.

To overcome the difficulty of unwinding the cocoons is the great problem which silk culturists have endeavored to solve. This can only be done when the proper solvent of the glutinous gum which holds the threads of the cocoon together is discovered. In France it is claimed that this discovery has been made, and that the cocoons are unwound in one continuous thread of silk. But the solvent in use has not yet transpired.

W. V. Andrews, of New York City, has given special attention to the rearing of this silkworm, under the conviction that the silk is of great commercial value, and that the moth can be more easily acclimated and raised in this country than any other of the silk-producing moths. He prefers it also to our own Polyphemus, because the latter only produces one cocoon annually, while this moth produces two. And while the food of the Polyphemus is of slow growth, the Ailanthus is of rapid growth, and will thrive on sterile ground. If, then, a good solvent for the cocoon gum can be obtained, the great difficulty in the culture and manufacture of this silk will be removed.

On this subject, in a letter received from Mr. Andrews, he says: "In reference to the solvent for the cocoon of the Cynthia, the best, so far as I have experimented, is pearlash. The solution should be quite hot, nearly boiling. But the main difficulty with me, as it must be with all amateurs, is the want of the proper reeling machinery.

"You know, of course, that it is usual to reel off four or five cocoons—sometimes more—in one thread, and it requires not only reeling machinery, which may be easily got up for experiment, but we also want something to twist the threads together. This is more difficult. It is quite true that a method has been discovered of reeling the Cynthia cocoons, but I believe they are generally carded and spun. I have seen beautiful silk made in this way."

Speaking of the raising of a double brood annually, he says, in the same letter: "To ensure two broods in the year, it will be necessary to collect the cocoons fed in the open air, and house them during the winter." The silk of the Cynthia is a sort of floss holding a middle place between wool and the silk of commerce, and it is admirably suited for the manufacture of fancy stuffs, shawls, and dresses. The perfect reeling of the cocoon would doubtless improve the texture of the silk, and increase its value for sewing and weaving purposes.

MARCH.

THE stormy season's come again,
To battle with the snow and rime,
To brighten up the face of earth;
For this is busy Nature's time
To thaw, to soak, to dry, to wipe
Away all trace of Winter's frown,
To make new homes for birds and blooms,
And lay Spring's vernal carpets down.

Rough March the faithful housewife is,
(Though somewhat famous as a scold,)
Who undertakes the cleaning job,
Despite of storm, and rain, and cold.
Just listen to her blustering voice,
Despatching orders near and far—
How loud and long the echoes roll,
Like bugle notes in time of war!

She raves with fury 'mong the trees,
Tears all their useless boughs away
The haughtiest forest monarchs bend
In helpless meekness to her sway.
Surprised, the leaves look forth to see
What all the racket is about;
And when, rough-shod, she treads the earth,
Come tiny flowers in wonder out.

Jack Frost her fiercest foe remains,
To tease, torment, to snap, and bite,
And keep a temper, never good,
Upon the verge of madness quite.
Resisting all her heavy *blows*,
He scarcely ever disappears,
Till gentle April comes along,
And melts him wholly with her tears.

Rough, honest March, we love thee well,
Of manners rude, of form uncouth;
For, nurtured in thy warm, brave heart,
Is glorious spring-time in its youth.
We hail with joy thy blustering voice,
Though loud its accent, harsh and long,
For in the intervals we hear
Sweet snatches of the blue-bird's song.

Mary Bynon Reese.

"To make another person hold his tongue, be you first silent."

APRIL. Calculated for North, East, South and West. 1871.

W. & D.		Month, Days, &c.	Latitude of Southern States.			Aspects of Planets and other Miscellanies.	Latitude of Middle States.			S. slow	Moon's Signs.		Moon south.	High Water. Phila.
			SUN rises & sets.		MOON r. & s.		SUN rises & sets.		MOON r. & s.					
			h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m.	s.	d.	h. m.	h. m.
S.	1	Theodore	5 49	6 13	3 34	♀ sets 8 h. 20 m. ◠	5 45	6 15	3 30	4	♍	2	9 8	11 20
14)		**Palm Sunday.**				**Matt. 21.**	**Day's length**	**12 h. 28 m. South. States.** **12 h. 32 m. Middle States.**						
S.	2	Theodosia	5 46	6 14	4 9	♄ rises 12 h. 50 m.	5 44	6 16	4 5	4	♍	17	9 59	12 15
M.	3	Ferdinand	5 45	6 15	4 53	☌ ☽ ♅ ♅ so. 10, 56.	5 43	6 17	4 49	3	♎	2	10 58	12 50
T.	4	Ambrose	5 43	6 17	5 24	🌕 ♃ sets 11 h. 9 m.	5 41	6 19	5 20	3	♎	17	11 40	1 36
W.	5	Maximus	5 42	6 18	rises.	**5.** Sir. sets 10,44.	5 40	6 20	rises.	3	♏	2	morn.	2 12
T.	6	*Maund Th.*	5 41	6 19	7 39	Orion sets 11 h. 12 m.	5 39	6 21	7 44	3	♏	17	12 36	2 50
F.	7	*Good Frid.*	5 40	6 20	8 34	☽ in Perigee.	5 37	6 23	8 39	2	♐	2	1 32	3 29
S.	8	Egesippus	5 38	6 22	9 21	☿ in Perihelion.	5 36	6 24	9 26	2	♐	17	2 19	4 9
15)		**Easter Sunday.**				**Mark 16.**	**Day's length**	**12 h. 46 m. South. States.** **12 h. 40 m. Middle States.**						
S.	9	*Easter S.*	5 37	6 23	10 18	♀ sets 8 h. 41 m. ◡	5 35	6 25	10 22	2	♑	1	3 17	4 52
M.	10	*Easter M.*	5 36	6 24	11 29	♄ rises 12 h. 14 m.	5 33	6 27	11 31	1	♑	14	4 16	5 36
T.	11	Julius	5 35	6 25	morn.	🌗 ☌ Neptune ☉ ☋	5 32	6 28	morn.	1	♑	27	5 17	6 24
W.	12	Eustachius	5 34	6 26	12 29	**12.** □ ♅ ☉	5 31	6 29	12 26	1	♒	10	6 20	7 23
T.	13	Justinus	5 33	6 27	1 28	♃ sets 10 h. 58 m.	5 29	6 31	1 24	1	♒	22	7 24	8 44
F.	14	Tyburtius	5 32	6 28	2 16	Wega rises 8 h. 14 m.	5 28	6 32	2 12	0	♓	4	8 19	10 15
S.	15	Olympia	5 31	6 29	3 9	Spica south 11, 42.	5 27	6 33	3 4	0	♓	16	8 59	11 14
16)		**1. Sunday after Easter.**				**John 20.**	**Day's length**	**13 h. 0 m. South. States.** **13 h. 8 m. Middle States.**						
S.	16	Calixtus	5 30	6 30	3 49	♀ sets 9 h. 4 m.	5 26	6 34	3 44	fast.	♓	28	9 40	12 13
M.	17	Rudolph	5 29	6 31	4 44	♅ south 9 h. 50 m.	5 25	6 35	4 40		♈	10	10 20	1 1
T.	18	Aeneas	5 28	6 32	5 33	🌑 Rigel sets 9, 57.	5 24	6 36	5 29	0	♈	21	10 59	1 43
W.	19	Anicetas	5 27	6 33	sets.	**19.** ♄ stationary	5 22	6 38	sets.	1	♉	3	11 57	2 14
T.	20	Sulpitius	5 26	6 34	7 44	♄ rises 11 h. 34 m.	5 21	6 39	7 50	1	♉	15	12 40	2 50
F.	21	Adularius	5 25	6 35	8 46	☌ ☽ ☿ ☉ ent. ♉	5 20	6 40	8 51	1	♉	27	1 22	3 20
S.	22	Cajus	5 24	6 36	9 43	♀ sets 9 h. 19 m.	5 18	6 42	9 49	1	♊	9	2 5	3 51
17)		**2. Sunday after Easter.**				**John 10.**	**Day's length**	**13 h. 14 m. South. States.** **13 h. 26 m. Middle States.**						
S.	23	*St. George*	5 23	6 37	10 42	☽ in Apo. ☿ gr. El. East	5 17	6 43	10 47	2	♊	22	2 50	4 21
M.	24	Albertus	5 22	6 38	11 40	☊ ☿ sets 7, 50. ◠	5 16	6 44	11 43	2	♋	4	3 38	4 55
T.	25	*St. Mark.*	5 21	6 39	morn.	♃ sets 10 h. 20 m.	5 15	6 45	morn.	2	♋	17	4 27	5 26
W.	26	Cletus	5 20	6 40	12 41	🌓 Ant. rises 9, 44.	5 14	6 46	12 39	2	♌	0	5 17	6 4
T.	27	Anastasius	5 19	6 41	1 28	**27.** Spica so. 11,1	5 12	6 48	1 25	2	♌	13	6 4	6 51
F.	28	Vitalis	5 18	6 42	2 15	Orion sets 9 h. 52 m.	5 11	6 49	2 10	3	♌	27	6 54	7 54
S.	29	Sybilla	5 18	6 42	2 46	Sirius sets 9, 11.	5 10	6 50	2 40	3	♍	11	7 46	9 16
18)		**3. Sunday after Easter.**				**John 16.**	**Day's length**	**13 h. 26 m. South. States.** **13 h. 2 m. Middle States.**						
S.	30	Eutropius	5 17	6 43	3 14	♅ south 8 h. 33 m.	5 9	6 51	3 8	3	♍	25	8 34	10 36

5631. 6. 7. Pesah, 2 first Days. 12. 13. Pesah, 2 last Days. 21. 22. Rosh Hodesh Iyar.

Moon's Phases.

SOUTHERN STATES.

	dy.	h.	m.
Full Moon	5	9	2 Mo.
Last Quarter	12	12	38 Mo.
New Moon	19	1	46 Aft.
First Quarter	27	6	31 Ev.

MIDDLE STATES.

	dy.	h.	m.
Full Moon	5	9	20 Mo.
Last Quarter	12	12	50 Mo.
New Moon	19	2	4 Aft.
First Quarter	27	6	49 Ev.

Conjectures of the Weather.

The 1, 2, 3, agreeable; 4, 5, 6, clear; 7, 8, 9, 10, changeable; 11, 12, 13, rainy; 14, 15, 16, pleasant; 17, 18, cool; 19, 20, changeable; 21, 22, 23, spring-weather; 24, 25, changeable; 26, 27, 28, warm, pleasant weather; 29, cloudy with rain; 30, thunder-showers and heavy winds.

Then April, with its grateful showers,
That pave the way for golden grain,
And make the very simplest flowers
To bless the gentle, silver rain.

The month of all the glorious year
That gives its promise to the hand
That holds the plough, the spade, the hoe,
And looks for substance from the land.

SPRING.

SPRING, the opening of the year,
Spring, to every poet dear;
Season of the budding flower,
Season of the lover's hour.

MARCH, the blusterer of the three;
APRIL, with her showers free;
MAY, sweet May and merry May,
Kisses Summer on her way.

"Necessity, by an equal law, takes the highest and the lowest."

MAY. Calculated for North, East, South and West. 1871.

W. & D.	Month, Days, &c.		Latitude of Southern States. SUN rises h. m.	sets h. m.	MOON r. & s. h. m.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises h. m.	sets h. m.	MOON r. & s. h. m.	S. fast m.	Moon's Signs. s.	d.	Moon south. h. m.	High Water. Phila. h. m.
M.	1	*Phil., Jac.*	5 16	6 44	3 47	♂ stationary. ◠	5 8	6 52	3 40	3	♎	10	9 26	11 44
T.	2	Sigismund	5 15	6 45	4 17	♀ sets 9 h. 31 m.	5 7	6 53	4 9	3	♎	25	10 16	12 19
W.	3	*Inv. of Cr.*	5 14	6 46	4 49	🌕 ☌ in Perihelion.	5 6	6 54	4 40	3	♏	11	11 8	12 59
T.	4	Florianus	5 14	6 46	rises.	**4.** ☿ stationary.	5 5	6 55	rises.	3	♏	26	morn.	1 41
F.	5	Godard	5 13	6 47	7 52	☽ in Perigee.	5 4	6 56	8 1	3	♐	11	12 2	2 20
S	6	Aggeus	5 12	6 48	8 59	♃ sets 9 h. 50 m. ◡	5 2	6 58	9 10	4	♐	26	1 7	3 4

19) 4. Sunday after Easter. John 16. Day's length {13 h. 38 m. South. States. 13 h. 58 m. Middle States.

S.	7	Domicilla	5 11	6 49	9 55	♉ Aldeb. sets 9, 25.	5 1	6 59	10 5	4	♑	9	2 10	3 48
M.	8	Stanislaus	5 10	6 50	10 45	☌ ☽ ♄ ♄ rises 10, 30.	5 0	7 0	10 55	4	♑	22	3 21	4 31
T.	9	Job	5 10	6 50	11 40	Arctur south 11 h. 6 m.	4 59	7 1	11 49	4	♒	5	4 19	5 20
W.	10	Gordianus	5 9	6 51	morn.	🌗 Sir. sets 8, 34.	4 58	7 2	morn.	4	♒	18	5 17	6 12
T.	11	Mamertus	5 8	6 52	12 45	**11.** Orion sets 9, 2.	4 57	7 3	12 40	4	♓	0	6 10	7 16
F.	12	Pancratius	5 7	6 53	1 29	☌ ♀ ♃ ♀ sets 9 h. 51 m.	4 56	7 4	1 21	4	♓	12	7 21	8 30
S.	13	Servatius	5 6	6 54	1 59	Spica south 10 h. 0 m.	4 55	7 5	1 49	4	♓	24	8 20	9 52

20) 5. Sunday after Easter. John 16. Day's length {13 h. 50 m. South. States. 14 h. 12 m. Middle States.

S.	14	Christian	5 5	6 55	2 25	♃ sets 9 h. 26 m.	4 54	7 6	2 15	4	♈	6	9 4	11 6
M.	15	Sophia	5 4	6 56	2 50	☌ ☿ ☉ Inferior.	4 53	7 7	2 40	4	♈	18	9 40	12 0
T.	16	Peregrinus	5 3	6 57	3 20	♂ south 7 h. 40 m.	4 53	7 7	3 10	4	♉	0	10 22	12 30
W.	17	Venantius	5 2	6 58	3 46	♄ rises 9 h. 56 m.	4 52	7 8	3 35	4	♉	12	11 10	1 8
T.	18	*Ascens. D.*	5 2	6 58	4 12	🌑 ☌ ☽ ☿	4 51	7 9	4 1	4	♉	24	11 48	1 44
F.	19	Potentian	5 1	6 59	sets.	**19.** Lib. so. 10, 56.	4 50	7 10	sets.	4	♊	6	12 16	2 15
S.	20	Torpetus	5 1	6 59	7 58	☽ in Apogee.	4 49	7 11	8 9	4	♊	19	1 8	2 55

21) 6. Sunday after Easter. John 15. Day's length {14 h. 0 m. South. States. 14 h. 24 m. Middle States.

S.	21	Prudence	5 0	7 0	8 48	☊ ☉ enters ♊ ◠	4 48	7 12	8 59	4	♋	1	1 48	3 26
M.	22	Helena	4 59	7 1	9 43	☌ ☽ ☌ ♀ sets 10, 0.	4 48	7 12	9 54	4	♋	14	2 26	3 57
T.	23	Desiderius	4 58	7 2	10 39	☌ ☽ ♅ ♃ sets 9, 2.	4 47	7 13	10 50	4	♋	27	3 16	4 32
W.	24	Johanna	4 58	7 2	11 38	Regulus sets 12, 38.	4 46	7 14	11 46	3	♌	10	4 4	5 8
T.	25	Urbanus	4 57	7 3	morn.	♀ gr. Hel. Lat. N.	4 46	7 14	morn.	3	♌	23	5 0	5 48
F.	26	Beda	4 57	7 3	12 37	🌓 Orion sets 8, 2.	4 45	7 15	12 34	3	♍	7	5 40	6 34
S.	27	Lucina	4 56	7 4	1 20	**27.** ♄ rises 9, 26.	4 44	7 16	1 12	3	♍	21	6 21	7 29

22) Whit Sunday. John 14. Day's length {14 h. 8 m. South. States. 14 h. 34 m. Middle States.

S.	28	*Whit Sun.*	4 56	7 4	1 59	♄ ☽ ♂ ♂ south 7, 0.	4 43	7 17	1 50	3	♎	5	7 16	8 38
M.	29	*Whit Mon.*	4 56	7 4	2 36	♀ sets 10 h. 14 m.	4 42	7 18	2 24	3	♎	20	8 6	9 52
T.	30	Wigand	4 55	7 5	3 5	Pollux sets 10 h. 56 m.	4 42	7 18	2 54	3	♏	5	8 56	10 54
W.	31	*Emberday*	4 55	7 5	3 32	Arctur 9 h. 36 m.	4 41	7 19	3 20	3	♏	20	9 46	11 35

5631. 5. Pesah Shenee. 9. Lag Laomer. 21. Rosh Hodesh Sivan. 26. 27. Shebuot.

Moon's Phases.

SOUTHERN STATES.

	dy.	h.	m.	
Full Moon	4	5	44	Ev.
Last Quarter	11	9	9	Mo.
New Moon	19	5	31	Mo.
First Quarter	27	7	47	Mo.

MIDDLE STATES.

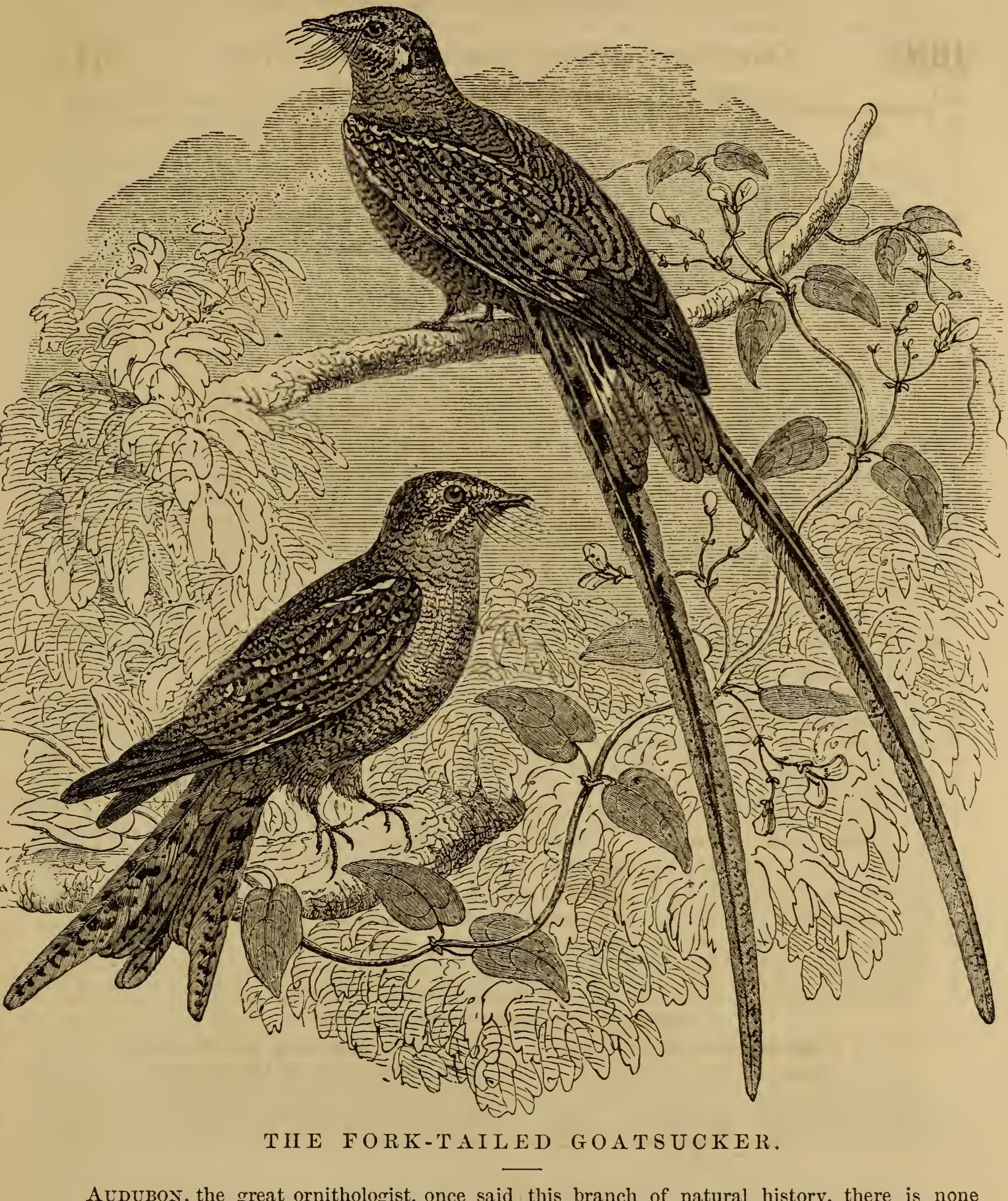
	dy.	h.	m.	
Full Moon	4	6	2	Ev.
Last Quarter	11	9	27	Mo.
New Moon	19	5	49	Mo.
First Quarter	27	8	5	Mo.

Conjectures of the Weather.

The 1, 2, 3, pleasant; 4, 5, rain; 6, 7, clear and warm; 8, 9, 10, thunder-showers; 11, 12, 13, clear and pleasant; 14, 15, 16, changeable; 17, 18, warm and thunder-showers; 19, 20, pleasant; 27, 22, cool and windy; 23, 24, 25, warm with showers; 26, 27, 28, clear and warm; 29, 30, 31 sultry and thunder showers.

May, with her wealth of joyous hours,
Her pic-nics and her girlish queen;
Her happy groups, that toss the hay,
With love and laughter made between.

When berries red, and rich, and ripe,
Besprinkle all the sunny fields
And cherries black, with luscious juice,
Each nodding tree in plenty yields.



THE FORK-TAILED GOATSUCKER.

AUDUBON, the great ornithologist, once said to us that it was well for his fame that the world did not understand the fascination that lay in the study of birds, or there would be so many ornithologists that he would be overshadowed to nothingness.

Among the thousands of species that comprise this branch of natural history, there is none having more interest than the class called by some Night Swallows. This class comprises all the varieties of the swallow, the whippoorwill, the night-hawk, and the goatsucker, the last the most curious of all. The goatsucker, in its different varieties, can be found in all parts of

"Union gives firmness and solidity to the humblest means."

JUNE. Calculated for North, East, South and West. 1871.

W. & D.	Month, Days, &c.		Latitude of Southern States. SUN rises	SUN sets	MOON r. & s.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises	SUN sets	MOON r. & s.	S. fast	Moon's Signs.		Moon south.	High Water. Phila.
			h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m	s.	d.	h. m.	h. m.
T.	1	Nicodemus	4 54	7 6	3 42	♀ sets 10 h. 18 m. ⌒	4 41	7 19	3 40	3	♐	5	10 40	12 21
F.	2	Marcellus	4 54	7 6	4 22	○ ♃ sets 8 h. 42 m.	4 40	7 20	4 10	2	♐	18	11 42	1 9
S.	3	Erasmus	4 53	7 7	rises.	**3.** ☽ in Peri. ◡	4 40	7 20	rises.	2	♑	3	morn.	1 59
23)	**Trinity Sunday.**					**John 3.**	**Day's length** { **14 h. 14 m. South. States.** **14 h. 42 m. Middle States.**							
S.	4	Darius	4 53	7 7	8 50	☌ ♀ ♅ ☌ ☽ ♄ ☋	4 39	7 21	9 2	2	♑	17	1 48	2 46
M.	5	Bonifacius	4 52	7 8	9 40	♄ rises 8 h. 56 m.	4 39	7 21	9 51	2	♑	29	2 52	3 34
T.	6	Artenius	4 52	7 8	10 20	Arctur south 9 h. 10 m.	4 38	7 22	10 31	2	♒	13	3 51	4 23
W.	7	Robertus	4 51	7 9	11 20	Antares south 11, 18.	4 38	7 22	11 26	2	♒	26	4 48	5 15
T.	8	*Corp. Chr.*	4 51	7 9	morn.	☾ Wega south 1,28.	4 37	7 23	morn.	1	♓	9	5 38	6 6
F.	9	Barnimus	4 51	7 9	12 24	**9.** ♀ sets 10, 19.	4 37	7 23	12 22	1	♓	21	6 26	7 1
S.	10	Flavius	4 51	7 9	1 0	☿ gr. Elong. West.	4 37	7 23	12 52	1	♈	3	7 8	8 4
24)	**1. Sunday after Trinity.**					**Luke 16.**	**Day's length** { **14 h. 20 m. South. States.** **14 h. 48 m. Middle States.**							
S.	11	Barnabas	4 50	7 10	1 34	♃ sets 8 h. 27 m.	4 36	7 24	1 22	1	♈	14	7 58	9 13
M.	12	Basilides	4 50	7 10	2 0	☿ gr. Hel. Lat. S.	4 36	7 24	1 48	0	♈	26	8 34	10 18
T.	13	Tobias	4 50	7 10	2 25	Regulus sets 11, 20.	4 36	7 24	2 11	0	♉	8	9 16	11 16
W.	14	Heliseus	4 50	7 10	2 54	♄ rises 8 h. 20 m.	4 35	7 25	2 41	slow	♉	20	9 58	12 0
T.	15	Vitus	4 50	7 10	3 22	☌ ☽ ☿ ☿ rises 3, 50.	4 35	7 25	3 10		♊	3	10 50	12 36
F.	16	Rolandus	4 50	7 10	3 52	● ☽ in Apogee.	4 35	7 25	3 40	0	♊	15	11 38	1 16
S.	17	St. Alban	4 50	7 10	sets.	**17.** Spica s. 1, 2. ⌒	4 35	7 25	sets.	0	♊	28	12 22	1 56
25)	**2. Sunday after Trinity.**					**Luke 14.**	**Day's length** { **14 h. 22 m. South. States.** **14 h. 50 m. Middle States.**							
S.	18	Arnolphus	4 49	7 11	8 10	☊ ♃ sets 8 h. 11 m.	4 35	7 25	8 22	1	♋	11	1 11	2 31
M.	19	Gervasius	4 49	7 11	9 8	Arctur south 8, 48.	4 35	7 25	9 20	1	♋	24	2 0	3 6
T.	20	Sylverius	4 49	7 11	9 50	Antares south 9, 24.	4 35	7 25	10 0	1	♌	7	2 50	3 42
W.	21	Raphael	4 48	7 12	10 30	☉ ent. ♋ Longest Day.	4 34	7 26	10 40	1	♌	20	3 38	4 15
T.	22	Achatius	4 49	7 11	11 10	*Summer commences.*	4 35	7 25	11 20	1	♍	4	4 26	4 52
F.	23	Agrippina	4 49	7 11	11 50	♀ sets 10 h. 14 m.	4 35	7 25	11 59	2	♍	18	5 0	5 31
S.	24	*John, Bap.*	4 49	7 11	morn.	Procyon sets 7, 40.	4 35	7 25	morn.	2	♎	2	5 30	6 16
26)	**3. Sunday after Trinity.**					**Luke 15.**	**Day's length** { **14 h. 20 m. South. States.** **14 h. 50 m. Middle States.**							
S.	25	Elogius	4 50	7 10	12 49	☽ **25.** ☌ ☽ ⛢	4 35	7 25	12 42	2	♎	16	6 0	7 4
M.	26	Jeremiah	4 50	7 10	1 21	Reg. sets 10, 22.	4 35	7 25	1 14	2	♏	0	6 48	8 0
T.	27	7 Sleepers	4 50	7 10	1 52	Librae south 8, 46.	4 35	7 25	1 44	3	♏	15	7 36	9 7
W.	28	Leo	4 50	7 10	2 22	☍ ♄ ☉ ♄ so. 11, 59.	4 35	7 25	2 12	3	♏	29	8 27	10 12
T.	29	*St. Peter*	4 50	7 10	2 52	Wega south 12h. 2 m.	4 36	7 24	2 42	3	♐	14	9 22	11 15
F.	30	Pauli mem.	4 50	7 10	3 18	☌ ♃ ☉ Spica s. 12,6. ◡	4 36	7 24	3 8	3	♐	28	10 24	12 1

5631. 19. 20. Rosh Hodesh Tamooz.

Moon's Phases.

SOUTHERN STATES.

	dy.	h.	m.
Full Moon	3	1	10 Mo.
Last Quarter	9	7	20 Ev.
New Moon	17	9	11 Ev.
First Quarter	25	5	24 Ev.

MIDDLE STATES.

	dy.	h.	m.
Full Moon	3	1	28 Mo.
Last Quarter	9	7	38 Ev.
New Moon	17	9	29 Ev.
First Quarter	25	5	42 Ev.

Conjectures of the Weather.

The 1, 2, thunder-showers; 3, 4, clear and warm; 5, 6, more rain, heavy showers; 7, 8. 9, pleasant; 10, 11, 12, warm with showers; 13, 14, hot and dry; 15, 16, 17, pleasant; 18, 19, 20, cloudy and rain; 21, 22, clear and warm; 23, 24, hot; 25, 26, sultry with showers; 27 up to the end of the mouth increased warm weather.

June, with its pure and cloudless skies,
Its countless stars and silver moon.
Its days of glory, nights that seem
Like some sweet spirit's whispered tune.

The harvest's pleasant ripening time,
The time when all the world is gay,
And Nature, that we may enjoy
It, gives us all her longest day.

the globe, our illustration being of a species found in Brazil and Paraguay, and known as *Psalurus*, or Fork-tailed Goatsucker, and is very rare. Its plumage is a bright ruddy demi-collar over the back of the neck, the balance of its feathery dress being dark. The tail is very long, and strongly forked, and in the male these two feathers are much the longest.

This bird, originally, obtained its name from the peasants of Greece and Italy, who, seeing them flying around the goats at nightfall, imagined that they sucked the milk, and hence the cognomon. Even Aristotle promulgated this superstition. In his "Natural History," he says: "The bird called *Ægothelas* is a mountain bird, a little smaller than a cuckoo. It lays two or three eggs, and is of a slothful nature; flying upon the goats, it sucks them; they say when it has sucked the teat it becomes dry, and the goat becomes blind." This superstition has, in many localities, come down to our own day. It feeds upon flies, moths, beetles, and other insects; and some naturalists assert that it is for the purpose of properly handling the beetle that the claw of some of the varieties of this bird is so constructed that the middle toe is very long, and toothed like a comb. This peculiarity causes the bird to sit differently on its perch than any other, grasping it sideways instead of across.

The crime of goat-sucking is not the only one laid to the charge of this harmless bird, for in some parts of England the country people insist that the species incident to their locality, commonly known as the Gern-owl, or Eve-jar, is very injurious to young calves, by striking at them, and thus inflicting the fatal disease known as *puckeridge*. It is only necessary to say that this superstition has as little reality as the other.

The best known in this country of the genus goatsucker are the whippoorwill and the night-hawk, the first familiar to every part of the country, and, like all its class, invested with a certain superstition, and the last familiar, not only to the country, but to the most crowded cities, uttering its peculiar cry at nightfull, as it circles about the houses, and through the streets, picking up its insect food, making short, rapid turns in the air, and sometimes approaching to the very windows of city dwellings. About the 1st of September it moves off to the south, only reappearing in the hottest weather.

The goatsucker, taken in all its varieties, is a harmless, useful bird, sweeping away many noxious insects, and doing no harm to the agriculturist. Of the beauty of its plumage little can be said, the specimen of which we give the illustration being the only one that can lay any claim to that valuable prerogative of the bird species.

OPEN THE SHUTTERS.

BY KATE WOODLAND.

"Open the shutters and let in the sun,"
Cheerily thus the poem did run;
But where I have read it, or how long ago,
Or what the next line is, I 'm sure I don't know:
But I often have thought, as I called it to mind,
The advice it contained was both needful and kind;
And I think 't would be well, in more places than one,
To "open the shutters and let in the sun."

Those one-idea Christians, both foreign and near,
Who think that religion is sombre and drear,
Who wear a long face, and love a sad voice,
And think it is wicked to laugh and rejoice,—
Whose hearts are shut out from God's beauty so tight
That they 're covered with mildew and wasted with blight,
Would find their enjoyment had only begun,
If they'd "open the shutters and let in the sun."

The young man whose talents by nature are fine,
Who is wasting them idly on euchre and wine,
Who has seed rich and plenteous sown in his heart,
Where the weeds are abundant, preventing their start,—
Would find, if he 'd pile up the rubbish around,
And cut down the weeds that o'ershadow the ground,
Buds, blossoms and fruit would appear one by one,
As he "opened the shutters and let in the sun."

There are some idle women, both youthful and old,
Whose hearts are imprisoned in fashion's stronghold;
Whose thoughts range no deeper or loftier than
A love of a bonnet, or a duck of a fan.
I would they could see, with one glance of the eye,
All the woe, want, and misery of earth sweeping by;
I think a new light on their spirits would dawn,
As they "opened the shutters and let in the sun."

Now, if I have stolen some poet's fine verse,
And clothed it in garments which make it look worse,
I really am sorry, but do not see how
The poet can help it, or I either, now;
My muse would n't wait while I searched o'er and o'er
For the poem I read such a long time before,
Of whose numerous lines I remembered but one—
"Open the shutters and let in the sun."

CURIOUS EPITAPHS.

On the tombstone of a Mr. Foote, Norwich, England.

"Here lies one Foote, whose death may thousands save,
For death hath now one foot within the grave."

On Gabriel John.

"Here lies the body of Gabriel John,
Who died in the year eighteen hundred and one.
Pray for his soul, or let it alone,
For it is all one to Gabriel John,
Who died in the year eighteen hundred and one.

On Sir John Strange.

"Here lies an honest lawyer,
That is Strange.

"The best remedy for injuries is to forget them."

JULY. Calculated for North, East, South and West. 1871.

W. & D.	Month. Days. &c.		Latitude of Southern States. SUN rises & sets. h. m.	h. m.	MOON r. & s. h. m.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises & sets. h. m.	h. m.	MOON r. & s. h. m.	S. slow m.	Moon's Signs. s.	d.	Moon south. h. m.	High Water. Phila. h. m.
S.	1	Theobald	4 50	7 10	3 48	☽ in Perigee. ☋ ◡	4 36	7 24	3 38	3	♑	11	11 26	12 44
27)	4. Sunday after Trinity.					Luke 6.	Day's length		14 h. 18 m. South. States. 14 h. 48 m. Middle States.					
S.	2	*Visit. V. M.*	4 51	7 9	rises.	○ **2.** ☌ ☽ ♄	4 36	7 24	rises.	4	♑	25	morn.	1 40
M.	3	Cornelius	4 51	7 9	8 32	☉ in Apogee.	4 37	7 23	8 42	4	♒	8	12 20	2 36
T.	4	*Independ.*	4 51	7 9	9 18	♆ sets 12 h. 16 m.	4 37	7 23	9 26	4	♒	21	1 18	2 27
W.	5	Demetrius	4 51	7 9	9 57	Regulus sets 9 h. 45 m.	4 37	7 23	10 5	4	♓	4	2 29	4 16
T.	6	*John Huss*	4 52	7 8	10 30	Antares seuth 9, 26.	4 38	7 22	10 37	4	♓	17	3 31	5 3
F.	7	Edelburga	4 52	7 8	11 2	☌ ☿ ♃ 7* rises 1, 6.	4 38	7 22	11 10	4	♓	29	4 42	5 50
S.	8	Aquila	4 52	7 8	11 44	Arctur sets 2 h. 9 m.	4 39	7 21	11 42	5	♈	11	5 49	6 38
28)	5. Sunday after Trinity.					Luke 5.	Day's length		14 h. 14 m. South. States. 14 h. 42 m. Middle States.					
S.	9	Zeno	4 53	7 7	morn.	☾ **9.** ♀ sets 9, 50.	4 39	7 21	morn.	5	♈	24	6 31	7 29
M	10	*J. Calvin b.*	4 53	7 7	12 18	♄ south 11, 27.	4 39	7 21	12 12	5	♉	4	7 12	8 21
T.	11	Pius	4 54	7 6	12 49	♄ ☿ ☉ Superior.	4 40	7 20	12 42	5	♉	16	7 50	9 24
W.	12	Henry	4 54	7 6	1 16	Spica sets 11 h. 14 m.	4 40	7 20	1 10	5	♉	29	8 42	10 25
T.	13	*Margareth*	4 55	7 5	1 52	☽ in Apogee.	4 41	7 19	1 44	5	♊	11	9 26	11 26
F.	14	Bonavent.	4 56	7 4	2 22	☌ ☿ ♅ ♆ sets 11, 41.	4 42	7 18	2 14	5	♊	23	10 10	12 2
S.	15	*Apostles' d.*	4 56	7 4	2 49	☊ Altair south 12, 7. ◡	4 42	7 18	2 41	6	♋	6	10 48	12 50
29)	6. Sunday after Trinity.					Matt. 5.	Day's length		14 h. 6 m. South. States. 14 h. 34 m. Middle States.					
S.	16	Hilary	4 57	7 3	3 20	● ☿ gr. Hel. Lat. N.	4 43	7 17	3 11	6	♋	19	11 25	1 32
M.	17	Alexius	4 57	7 3	sets.	**17.** Dog days begin.	4 44	7 16	sets.	6	♌	3	11 59	2 13
T.	18	Maternus	4 58	7 2	8 13	♀ gr. Elong. East.	4 45	7 15	8 20	6	♌	16	12 46	2 49
W.	19	Ruffina	4 58	7 2	8 50	☌ ♅ ☉ ♄ south 10, 40.	4 45	7 15	8 56	6	♍	0	1 37	3 26
T.	20	Elijah	4 59	7 1	9 19	♀ in ☋ Rigel ris. 3, 36	4 46	7 14	9 26	6	♍	14	2 26	3 59
F.	21	Praxedes	5 0	7 0	9 52	☌ ☽ ♀ ♀ sets 9, 18.	4 47	7 13	9 59	6	♍	28	3 11	4 36
S.	22	*Mar. Mag.*	5 1	6 59	10 22	Regulus sets 8 h. 40 m.	4 48	7 12	10 29	6	♎	13	3 57	5 15
30)	7. Sunday after Trinity.					Mark 8.	Day's length		13 h. 58 m. South. States. 14 h. 24 m. Middle States.					
S.	23	Apolinaris	5 1	6 59	10 52	☌ ☽ ♆ ☉ enters ♌	4 48	7 12	10 59	6	♎	27	4 44	5 55
M.	24	Christiana	5 2	6 58	11 23	♆ sets 11 h. 2 m.	4 49	7 11	11 28	6	♏	11	5 21	6 38
T.	25	*St. James*	5 3	6 57	11 53	☽ **25.** Spica sets 10, 25.	4 50	7 10	11 59	6	♏	25	6 19	7 29
W.	26	*St. Anne*	5 4	6 56	morn.	Pollux sets 8 h. 15 m.	4 51	7 9	morn.	6	♐	9	7 12	8 28
T.	27	Martha	5 4	6 56	12 44	♄ south 10 h. 6 m.	4 52	7 8	12 38	6	♐	23	8 9	9 36
F.	28	Pantaleon	5 5	6 55	1 25	☋ ♀ sets 9 h. 4 m.	4 53	7 7	1 19	6	♑	7	9 10	10 49
S.	29	Beatrix	5 6	6 54	2 22	☽ in Perigee. ☌ ☽ ♄	4 53	7 7	2 16	6	♑	20	10 14	12 0
31)	8. Sunday after Trinity.					Matt. 7.	Day's length		13 h. 46 m. South. States. 14 h. 12 m. Middle States.					
S.	30	Upton	5 7	6 53	3 20	○ Wega south 9, 55.	4 54	7 6	3 14	6	♒	4	11 18	12 35
M.	31	Germanus	5 7	6 53	rises.	**31.** Ald. r. 12, 49	4 55	7 5	rises.	6	♒	17	morn.	1 39

5631. 6. Fast of Tamooz. 19. Rosh Hodesh Ab. 27 Tishabeab.

Moon's Phases.

SOUTHERN STATES.

	dy.	h.	m.
Full Moon	2	8	14 Mo.
Last Quarter	9	7	46 Mo.
New Moon	17	12	3 Aft.
First Quarter	25	12	27 Mo.
Full Moon	31	3	52 Aft.

MIDDLE STATES.

	dy.	h.	m.
Full Moon	2	8	32 Mo.
Last Quarter	9	8	4 Mo.
New Moon	17	12	21 Aft.
First Quarter	25	12	45 Mo.
Full Moon	31	4	10 Aft.

Conjectures of the Weather.

The 1, 2, 3, 4, increased hot weather; 5, 6, somewhat pleasanter; 7, 8, 9, cloudy and thunder-showers; 10, 11, hot and dry; 12, 13, 14, cloudy with rain; 15, 16, 17, clear and hot; 18, 19, 20, pleasant; 21, 22, rainy; 23, 24, 25, warm weather; 26, 27, changeable; 28, up to the end of the month cloudy and thunder-showers.

July, the harvest of the year,
The month to bless the farmer's toil;
When golden grain, beneath the scythe,
Is gathered from the laughing soil.

The month when busy cits begin
To pine for freedom and for air,
And Fashion gathers by the sea
The old, the young, the plain, the fair.

SUMMER.

SUMMER toys with gentle Spring,
Like a young bird on the wing;
JUNE, with roses blushing red,
Hangs her fair and modest head,

Till JULY, with fiery face,
Anxious to begin his race,
Catches up her last drawn sigh,
And joins with AUGUST rushing by.

"The envious man grows lean at the success of his neighbor."

AUGUST. Calculated for North, East, South and West. 1871.

W. & D.	Month, Days, &c.		Latitude of Southern States. SUN rises & sets. h. m.	h. m.	MOON r. & s. h. m.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises & sets. h. m.	h. m.	MOON r. & s. h. m.	S. slow m.	Moon's Signs. s.	d.	Moon south. h. m.	High Water. Phila. h. m.
T.	1	*Lammasd.*	5 7	6 53	7 54	☌ sets 8 h. 59 m. ◡	4 56	7 4	8 0	6	♓	0	12 14	2 27
W.	2	Stephen	5 8	6 52	8 27	♂ sets 10 h. 46 m.	4 57	7 3	8 33	6	♓	12	1 28	3 17
T.	3	Augustus	5 9	6 51	8 56	♄ south 9 h. 30 m.	4 58	7 2	9 1	6	♓	25	2 39	4 1
F.	4	Dominick	5 10	6 50	9 21	Orion rises 2 h. 20 m.	4 59	7 1	9 26	6	♈	7	3 42	4 42
S.	5	Oswald	5 11	6 49	9 54	7* rises 11 h. 6 m.	5 0	7 0	9 50	6	♈	19	4 26	5 24
32) 9. Sunday after Trinity.						**Luke 16.**	**Day's length { 13 h. 36 m. South. States. 13 h. 58 m. Middle States.**							
S.	6	*An. of Chr.*	5 12	6 48	10 19	🌗 Antares so. 7, 14.	5 1	6 59	10 24	6	♉	1	5 10	6 4
M.	7	Godfrey	5 13	6 47	10 55	**7.** Alt. so. 10, 37.	5 2	6 58	11 0	5	♉	13	5 50	6 44
T.	8	Emily	5 13	6 47	11 31	☿ in ☋ ♀ sets 8, 49.	5 4	6 56	11 35	5	♉	25	6 38	7 28
W.	9	Ericus	5 14	6 46	morn.	Sirius rises 4 h. 19 m.	5 5	6 55	morn.	5	♊	7	7 24	8 20
T.	10	*St. Lawr.*	5 15	6 45	12 12	☽ in Apogee.	5 6	6 54	12 8	5	♊	19	8 10	9 26
F.	11	Titus	5 16	6 44	12 52	☊ Wega south 9, 9 ◠	5 7	6 53	12 48	5	♋	2	8 50	10 35
S.	12	Clara	5 17	6 43	1 38	Fomal. south 1 h. 21 m.	5 8	6 52	1 34	5	♋	14	9 31	11 46
33) 10. Sunday after Trinity.						**Luke 19.**	**Day's length { 13 h. 24 m. South. States. 13 h. 42 m. Middle States.**							
S.	13	Hildebert	5 18	6 42	2 24	☌ ☽ ♃ ♃ rises 2, 30.	5 9	6 51	2 20	5	♋	27	10 14	12 20
M.	14	Eusebia	5 19	6 41	3 6	☌ ☽ ♅ ♄ south 8, 41.	5 10	6 50	3 2	4	♌	11	10 54	1 10
T.	15	*Asc. V. M.*	5 20	6 40	3 50	🌑 Altair so. 10, 6.	5 11	6 49	3 46	4	♌	25	11 34	1 56
W.	16	Rochus	5 21	6 39	sets.	**16.** Orion ris. 1, 12	5 12	6 48	sets.	4	♍	10	12 15	2 30
T.	17	Bertram	5 22	6 38	8 2	Sirius rises 3 h. 45 m.	5 14	6 46	8 6	4	♍	25	1 8	3 10
F.	18	Agapetus	5 23	6 37	8 37	☌ ☽ ☿ ♂ sets 10, 24.	5 15	6 45	8 40	4	♎	9	1 56	3 44
S.	19	Sebaldus	5 24	6 36	9 8	☌ ☽ ♀ ♀ sets 8, 10.	5 16	6 44	9 11	3	♎	24	2 41	4 18
34) 11. Sunday after Trinity.						**Luke 18.**	**Day's length { 13 h. 10 m. South. States. 13 h. 26 m. Middle States.**							
S.	20	Bernard	5 25	6 35	9 37	♀ gr. Brilliancy.	5 17	6 43	9 41	3	♏	8	3 27	4 52
M.	21	Rebecca	5 26	6 34	10 9	☿ gr. Elong. East.	5 18	6 42	10 12	3	♏	22	4 16	5 30
T.	22	Philibert	5 27	6 33	10 46	🌓 ☿ sets 8 h. 16 m.	5 20	6 40	10 49	3	♐	6	5 6	6 14
W.	23	Zacheus	5 28	6 32	11 26	**23.** ☉ enters ♍	5 21	6 39	11 29	2	♐	20	6 4	6 59
T.	24	*St. Barth.*	5 29	6 31	morn.	☋ ♃ rises 2 h. 9 m. ◡	5 22	6 38	morn.	2	♑	4	6 58	7 53
F.	25	Ludovicus	5 30	6 30	12 20	☌ ☽ ♄ ♄ sets 12, 48.	5 23	6 37	12 17	2	♑	17	7 56	9 6
S.	26	Samuel	5 31	6 29	1 13	☽ in Peri. ♂ sets 10, 8.	5 24	6 36	1 10	2	♒	0	8 50	10 37
35) 12. Sunday after Trinity.						**Mark 17.**	**Day's length { 12 h. 56 m. South. States. 13 h. 10 m. Middle States.**							
S.	27	Gebhard	5 32	6 28	2 15	♀ sets 7 h. 50 m.	5 25	6 35	2 12	1	♒	12	9 48	11 59
M.	28	*St. August*	5 33	6 27	3 19	Dog days End.	5 27	6 33	3 16	1	♒	26	10 46	12 32
T.	29	*St. John b.*	5 34	6 26	4 23	🌕 Altair so. 9, 12.	5 28	6 32	4 20	1	♓	8	11 40	1 31
W.	30	Benjamin	5 35	6 25	rises.	**30**. Wega so. 7, 56	5 29	6 31	rises.	1	♓	21	morn.	2 16
T.	31	Paulina	5 36	6 24	7 38	♃ rises 1 h. 53 m.	5 31	6 29	7 41	0	♈	3	12 36	3 3

5631. 2. Tubeab. 17. 18. Rosh Hodesh Elool.

Moon's Phases.

SOUTHERN STATES.	dy.	h.	m.	MIDDLE STATES.	dy.	h.	m.
Last Quarter	7	11	0 Ev.	Last Quarter	7	11	18 Ev.
New Moon	16	1	39 Mo.	New Moon	16	1	57 Mo.
First Quarter	23	6	15 Mo.	First Quarter	23	6	33 Mo.
Full Moon	30	1	1 Mo.	Full Moon	30	1	19 Mo.

Conjectures of the Weather.

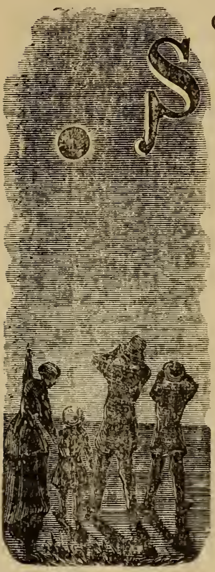
The 1, 2, clear and warm; 3, 4, sultry and rain; 5, 6, warm; 8, 9, changeable; 10, 11, 12, hot weather; 13, 14, 15, warm and thunder-showers; 16, 17, 18, rainy; 19, 20, 21, clear and pleasant; 22, 23, cloudy, more rain; 24, 25, 26, pleasant; 27, up to the end of the month changeable.

Sweet August! month of fruits and flirts,
Of love, of peaches, and romance,
Of moonlight rows upon the lake,
Of sea baths, sentiment, and dance.

Of wounded hearts for time to heal,
Next winter, in the busy town,
Some by a matrimonial cure,
And some by gently—backing down.

THE GREATEST ECLIPSE EVER KNOWN.

From Frank Leslie's Illustrated Newspaper.



SOLAR eclipses depend on so many circumstances for their magnitude, that it very seldom happens that even a close approach takes place to the greatest possible continuance of total obscuration.

It has been shown to be *possible* that the sun should be wholly obliterated from view by the passing moon for even seven minutes and fifty-eight seconds; yet there has been no eclipse during the past two thousand years in which the totality has lasted seven minutes.

During the total eclipse of 1860, which was considered sufficiently important to be made the object of scientific observation from nearly every country in Europe (England sending out the celebrated Himalaya expedition), the totality did not last four minutes.

The total eclipse visible in Sweden in 1851 was somewhat more considerable, but lasted less than five minutes. We have to go back to the famous eclipse of June 17th, 1433, the occurrence of which was long remembered by the people of Scotland as the *Black Hour*, before we meet with one which lasted more than five minutes and a half. And thence we must go back over no less than two thousand and eighteen years, to the eclipse of Thales (May 28th, 585 B. C.,) before we find another of similar magnitude.

When we consider what are the conditions which must be fulfilled in order that an eclipse should be the greatest possible, we shall readily understand why it is that no such eclipse has yet taken place, and why so few present even an approach to the maximum duration of totality.

In the first place, the sun should be at his greatest distance from the earth, in order that he may *look* as small as possible. We know that this happens in the beginning of July. Therefore, the nearer the epoch of an eclipse to this date, the longer will be the duration of totality, so far as this particular condition is concerned.

Secondly, the moon must be as near as possible to the earth. But, as respects this condition, there is less simplicity than with regard to the former. Once in every lunar month the moon is in perigee, but the lunar month is not commensurate with the year, so that we can not name any fixed dates at which the moon will be at her least distance from the earth. Nor is this all. The figure of the moon's orbit is continually fluctuating in form and varying in size, so that at some of her perigees she is farther off than at others. It is only at long intervals that she is at the *absolute* as distinguished from the *monthly* perigee of her orbit.

Lastly, the moon's distance from the earth's surface varies according to the point of the surface from which we estimate it, and is clearly least for that point which is on the line joining the centers of the earth and moon. Therefore. in order that the moon may look as large as possible, she must be seen in the zenith; and it follows, of course, that the sun must be in the zenith, in order that there may be an eclipse of maximum duration. But the sun never rises to the zenith except at places within the tropics. Hence, an eclipse of maximum duration can only happen in tropical countries.

When to the causes which have been enumerated above, we add the infrequency of solar eclipses, and the fact that many of them are partial, and more are annular, we see why it is that long intervals separate the more important total eclipses, and that not one eclipse in many hundreds of years exhibits a close approach to the maximum duration of totality.

The eclipse of August 17, 1868, was remarkable for the closeness with which two of the three conditions named above were approximated to.

As the eclipse occurred in August, the sun was not very close to his apogee, a relation which, as already mentioned, holds in the beginning of July. But the moon was not only very close to the perigee of her orbit, but the perigee was one of unusual proximity; and where the eclipse took place at noon, the sun was only two and a half degrees from the zenith. The combination of these favorable circumstances led to a totality lasting no less than six minutes and fifty seconds, a duration unprecedented within historical times, and which is unlikely to have any parallel for ten or twenty centuries.

In this great eclipse the shadow touched the earth first near Gondar, in Abyssinia. Thence it swept across the strait of Bab-el-Mandel, the zone of totality covering Perim, Mocha, and Aden. Leaving Arabia by the cape Ras-Furtak, the shadow traversed a portion of the course of the mail steamers from Aden to Bombay, and

"He who subdues his anger conquers his greatest enemy."

SEPTEMBER. Calculated for North, East, South and West. 1871.

W. & D.	Month, Days, &c.	Latitude of Southern States.			Aspects of Planets and other Miscellanies.	Latitude of Middle States.			S. fast	Moon's Signs.		Moon south.	High Water. Phila.
		SUN rises & sets.		MOON r. & s.		SUN rises & sets.		MOON r. & s.					
		h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m.	s.	d.	h. m.	h. m.
F.	1	Egidius	5 37	6 23	8 19	♀ sets 7 h. 30 m. ◡	5 32	6 28	8 22	0	♈	15	1 32	3 43
S.	2	Eliza	5 38	6 22	8 45	♅ sets 9 h. 56 m.	5 33	6 27	8 48	0	♈	27	2 18	4 16
36)		**13. Sunday after Trinity.**				**Luke 10.**	**Day's length**	**12 h. 42 m. South. States. 12 h. 52 m. Middle States.**						
S.	3	Mansuetus	5 39	6 21	9 11	♀ stationary	5 34	6 26	9 14	1	♉	9	3 4	4 52
M.	4	Moses	5 40	6 20	9 40	♄ sets 12 h. 28 m.	5 35	6 25	9 42	1	♉	21	3 48	5 26
T.	5	Nathaniel	5 42	6 18	10 13	Spica sets 7, 55.	5 37	6 23	10 16	1	♊	3	4 30	5 29
W.	6	Magnus	5 43	6 17	10 52	🌗 **6.** Sir. rises 2, 37.	5 38	6 22	10 54	2	♊	15	5 16	6 38
T.	7	Regina	5 44	6 16	11 36	☽ in Apogee. ◠	5 39	6 21	11 38	2	♊	27	6 3	7 24
F.	8	*N. of V. M.*	5 45	6 15	morn.	☿ gr. Hel. Lat. S. ☊	5 40	6 20	morn.	2	♋	9	6 52	8 26
S.	9	Bruno	5 46	6 14	12 32	♀ sets 6 h. 59 m.	5 42	6 18	12 30	3	♋	27	7 40	9 50
37)		**14. Sunday after Trinity.**				**Luke 17.**	**Day's length**	**12 h. 26 m. South. States. 12 h. 34 m. Middle States.**						
S.	10	Pulcheria	5 47	6 13	1 34	☌ ☿ ♃ ♃ rises 1, 30.	5 43	6 17	1 32	3	♌	5	8 32	11 12
M.	11	Protus	5 48	6 12	2 32	♅ sets 9 h. 30 m.	5 44	6 16	2 30	3	♌	19	9 21	12 2
T.	12	J. Wickliffe	5 49	6 11	3 24	♄ sets 12 h. 10 m.	5 46	6 14	3 22	4	♍	4	10 12	12 47
W.	13	Amatus	5 50	6 10	4 16	Aldeb. rises 10,6.	5 47	6 13	4 14	4	♍	18	11 1	1 32
T.	14	*El. H. Crs.*	5 5[illegible]	[illegible] 9	sets.	🌑 **14.** ☌ ☽ ☿	5 48	6 12	sets.	4	♎	3	11 58	2 4
F.	15	Nicetas	5 5[illegible]	[illegible] 8	7 16	♀ gr. Hel. Lat. S.	5 49	6 11	7 18	5	♎	18	12 36	2 40
S.	16	Euphemia	5 53	6 7	7 48	♀ sets 6 h. 30 m.	5 51	6 9	7 50	5	♏	3	1 24	3 18
38)		**15. Sunday after Trinity.**				**Matt. 6.**	**Day's length**	**12 h. 12 m. South. States. 12 h. 16 m. Middle States.**						
S.	17	Lampertus	5 54	6 6	8 20	☌ ☿ ☉ Inferior.	5 52	6 8	8 22	5	♏	18	2 15	3 52
M.	18	Siegfried	5 55	6 5	8 56	♃ rises 1 h. 11 m.	5 53	6 7	8 57	6	♐	3	3 5	4 29
T.	19	Micleta	5 56	6 4	9 35	♄ ☽ ♅ ♅ sets 9, 10.	5 55	6 5	9 36	6	♐	17	3 56	5 6
W.	20	*Emberday.*	5 57	6 3	10 40	☽ in Perigee ☊ ◡	5 56	6 4	10 41	6	♑	1	4 54	5 43
T.	21	S. Matth. E.	5 58	6 2	11 51	🌓 **21.** ♄ sets 11, 14	5 58	6 2	11 52	7	♑	14	5 52	6 35
F.	22	Maurice	5 59	6 1	morn.	Markab south 11, 2.	5 59	6 1	morn.	7	♑	27	6 52	7 32
S.	23	Hosea	6 0	6 0	12 44	☉ ent. ♎ D. & N. equal	6 0	6 0	12 44	7	♒	10	7 51	8 59
39)		**16. Sunday after Trinity.**				**Luke 7.**	**Day's length**	**11 h. 58 m. South. States. 11 h. 58 m. Middle States.**						
S.	24	*St. John c.*	6 1	5 59	1 49	*Autumn commences.*	6 1	5 59	1 50	8	♒	23	8 50	10 33
M.	25	Cleophas	6 2	5 58	2 55	☿ stationary.	6 3	5 57	2 56	8	♓	5	9 46	11 54
T.	26	Justina	6 4	5 56	3 58	☌ ♀ ☉ inferior □ ♄ ☉	6 4	5 56	3 59	9	♓	17	10 36	12 24
W.	27	Cosmus	6 5	5 55	5 6	Sirius rises 1, 23.	6 5	5 55	4 8	9	♓	29	11 24	1 20
T.	28	Wencesl.	6 6	5 54	rises.	🌕 **28.** ♅ sets 8, 52.	6 7	5 53	rises.	9	♈	11	morn.	2 2
F.	29	*S. Michael*	6 7	5 53	6 50	♃ rises 12 h. 49 m.	6 8	5 52	6 48	10	♈	23	12 10	2 38
S.	30	Jerome	6 8	5 52	7 16	Rigel rises 10 h. 15 m.	6 9	5 51	7 14	10	♉	5	1 21	4 14

5632. 16. 17. Tishree Rosh Hashanah. 18. Fast of Guedalyah. 25. Kipoor.

Moon's Phases.

	Southern States.			Middle States.		
	dy.	h.	m.	dy.	h.	m.
Last Quarter	6	4	53 Ev.	6	5	11 Ev.
New Moon	14	1	55 Aft.	14	2	13 Aft.
First Quarter	21	12	1 Aft.	21	12	19 Aft.
Full Moon	28	12	35 Aft.	28	12	53 Aft.

Conjectures of the Weather.

The 1, 2, 3, damp and rainy; 4, 5, pleasant; 6, 7, 8, sultry; 9, 10, 11, warm and damp; 12, 13, pleasant; 14, 15, 16, cloudy and showers; 17, 18, 19, clear and hot; 20, 21, 22, sultry; 23, 24, damp and warm; 25, 26, 27, clear and pleasant; 28, 29, 30, soultry.

September, still with sunny skies,
Brings apples, blushing rosy red;
And in the turning forest leaf,
The first thought of the summer fled.

And with its coming Fashion's crowd
Rush back, in haste, to home again;
And cities waken from the sleep
In which, through summer, they have lain.

entered the peninsula of India between Goa and Rajapoor. After crossing the peninsula, the shadow traversed the Gulf of Siam and the islands of Borneo and Celebes. The shadow left the earth near the New Hebrides, where totality began at sunset.

It may seem, at first sight, that the region traversed by the eclipse is inconveniently situated; and certainly, an eclipse visible in Europe would have a better chance of being closely watched. But, as a matter of fact, an eclipse of this magnitude *can not* take place in Europe; and of all places in which such an eclipse can take place, that is, of all places in or near the tropics, the region actually traversed by the eclipse is the most favorable. Let any one take a terrestrial globe, and having first examined the nature and extent of the track of totality indicated above, let him seek for any corresponding region within the tropics which shall contain as many stations where Europeans could take part in the observation. He will find that no other region of similar extent is even comparable with the actual track of the eclipse in this respect. In fact, it is not going too far to say, that if the track of totality had lain anywhere else (within the tropics), save on or near its actual position, the eclipse would hardly have been made the object of expeditions from Europe. As it was, the eclipse began just on the borders of the habitable parts of Africa, traversed the most favorable part of the Indian peninsula, and parts of the East Indies which have been civilized by the Dutch. It might seem that it would be sufficient if the eclipse were visible from only one place that could be conveniently reached, and especially if (as is the case in parts of India), there was an almost absolute certainty of the prevalence of fine weather. But in reality this is not the case. The chief interest of an eclipse centers on the observation of those singular red masses which are observed to project beyond the outline of the sun's disc at the time of total obscuration; and astronomers have long been anxious to know whether these objects are liable to process of change. The only chance of determining whether this is the case, lies in the observation of the totality from places separated by wide intervals.

◆

THE following sentence of only thirty-four letters contains all the letters in the alphabet: "John quickly extemporized five tow bags."

WHAT is stronger in death than life? An old yellow-legged hen.

THE Union Pacific—A quiet marriage.

ENIGMAS.

1.

A BRIDGE weaves its own arch with pearls
High o'er a tranquil, dark gray sea;
And in a moment it unfurls
Its dizzy span unbounded, free.

The tallest barks, with swelling sail,
May pass beneath its arch with ease
It bears no burden, 'tis too frail,
And, when thou would'st approach, it flees.

With floods it came, and disappears
Whene'er the water's source is sealed;
Say where its lofty arch it rears,
And by what architect revealed?

2.

KNOW'ST thou the picture soft of hue?
Itself the fountain of its light;
Each moment changing to the view,
Yet ever perfect, fresh, and bright.
'Tis painted in the smallest space,
Within the smallest frame enclosed;
But of earth's greatness not a trace
Without it e'er had been disclosed.

Canst thou to me the crystal name?
No jewel equals it in worth;
It flashes, but without a flame,
Drinks in the boundless sphere of earth.
E'en Heaven's self in radiance plays
Within its magic circle bright,
Yet, though it drinks celestial rays,
More lovely far is its own light.

3.

IT is a bird, and, swift of motion,
Vies even with the eagle's wing;
It is a fish, and ploughs the ocean,
Which ne'er hath borne a vaster thing;
It is an elephant so strong,
His back the mighty tower's seat;
'Tis like the creeping spider throng
Whene'er it moves its nimble feet,
And when together it hath bound
With iron fang the earth and main,
It stands as if on solid ground,
And braves the raging hurricane.

4.

UPON a spacious meadow graze
A host of silver fleecy sheep;
As now they wander 'neath our gaze
The oldest man beheld them creep.

They wax not old, and drink life's source
From out an inexhausted bourne;
A shepherd guides them in their course
With lovely winding silver horn.

He drives them out through golden doors,
And counts them when at eve they meet,
The loss of not a lamb deplores,
Though oft their journey they repeat.

A faithful dog is at his side,
A cheerful ram before them goes.
Where is this flock, this pasture wide?
And who the shepherd is, disclose!

"That man has the fewest wants who is the least anxious for wealth."

OCTOBER. Calculated for North, East, South and West. 1871.

W. & D.	Month. Days, &c.		Latitude of Southern States. SUN rises	SUN sets	MOON r. & s.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises	SUN sets	MOON r. & s.	S. fast	Moon's Signs.		Moon south.	High Water. Phila.
			h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m.	s.	d.	h. m.	h. m.
40) 17. Sunday after Trinity.						**Luke 14.**	**Day's length**	**11 h. 42 m. South. States.** **11 h. 38 m. Middle States.**						
S.	1	Remigius	6 9	5 51	7 50	♀ sets 8 h. 40 m. ◡	6 11	5 49	7 47	10	♉	17	2 23	3 47
M.	2	*C. Columb.*	6 10	5 50	8 29	♄ sets 11 h. 8 m.	6 12	5 48	8 26	10	♉	29	3 10	4 18
T.	3	Jairus	6 11	5 49	9 2	☿ gr. Elong. West.	6 13	5 47	8 59	11	♊	11	3 58	4 50
W.	4	Francis	6 12	5 48	9 41	♀ rises 5 h. 10 m.	6 15	5 45	9 39	11	♊	23	4 42	5 20
T.	5	Placidus	6 14	5 46	10 29	🌗 ☽ in Apo. ☊ ◠	6 16	5 44	10 27	11	♋	5	5 32	5 58
F.	6	Fides	6 15	5 45	11 26	**6.** Sir. r. 12, 48.	6 17	5 43	11 24	12	♋	18	6 20	6 41
S.	7	Amelia	6 16	5 44	morn.	☌ ☽ ♃ ♃ rises 12, 29.	6 19	5 41	morn.	12	♌	0	7 12	7 42
41) 18. Sunday after Trinity.						**Matt. 22.**	**Day's length**	**11 h. 26 m. South. States.** **11 h. 20 m. Middle States.**						
S.	8	Pelagius	6 17	5 43	12 25	♅ sets 8 h. 19 m.	6 20	5 40	12 28	12	♌	14	8 2	9 4
M.	9	Dionysius	6 18	5 42	1 31	Andromeda so. 11, 2.	6 21	5 39	1 34	13	♌	28	8 52	10 33
T.	10	Gereon	6 19	5 41	2 36	♄ sets 10 h. 32 m.	6 23	5 37	2 39	13	♍	12	9 30	10 48
W.	11	Burkhart	6 20	5 40	3 56	☌ ☽ ♀ ♀ rises 4, 39.	6 24	5 36	3 59	13	♍	26	10 10	11 14
T.	12	Veritas	6 21	5 39	4 41	☿ gr. Hel. Lat. N.	6 25	5 35	4 44	13	♎	12	10 50	12 58
F.	13	Coloman	6 23	5 37	5 15	🌑 ☿ rises 5 h. 2 m.	6 26	5 34	5 18	14	♎	27	11 32	1 38
S.	14	Fortuna	6 24	5 36	sets.	**14.** ♀ stationary	6 27	5 33	sets.	14	♏	12	12 26	2 10
42) 19. Sunday after Trinity.						**Matt. 9.**	**Day's length**	**11 h. 10 m. South. States.** **11 h. 2 m. Middle States.**						
S.	15	Hedwick	6 25	5 35	6 22	♃ rises 12 h. 10 m.	6 29	5 31	6 18	14	♏	27	1 12	2 45
M	16	*Gallus*	6 26	5 34	7 6	☽ in Peri. ☍ Nep. ⊙	6 30	5 30	7 2	14	♐	12	2 2	3 24
T.	17	Florentine	6 27	5 33	8 4	☌ ☽ ♅ ♅ sets 7, 58. ◡	6 31	5 29	8 0	14	♐	26	2 42	4 3
W.	18	*St. Luke*	6 28	5 32	9 12	☋ Altair south 6, 10.	6 32	5 28	9 8	15	♑	10	3 41	4 45
T.	19	Ptolomy	6 29	5 31	10 20	☌ ☽ ♄ ♄ sets 10, 0.	6 33	5 27	10 16	15	♑	24	4 46	5 29
F.	20	Felicianus	6 30	5 30	11 27	🌓 **20.** ♀ rises 4, 11	6 35	5 25	11 24	15	♒	7	5 48	6 19
S.	21	Ursula	6 31	5 29	morn.	Sir. rises 11, 53.	6 36	5 24	morn.	15	♒	20	6 45	7 27
43) 20. Sunday after Trinity.						**Matt. 22.**	**Day's length**	**10 h. 56 m. South. States.** **10 h. 44 m. Middle States.**						
S.	22	Cordula	6 32	5 28	12 25	□ ♃ ⊙ ♃ rises 11, 50.	6 38	5 22	12 28	15	♓	2	7 41	8 56
M.	23	Severinus	6 33	5 27	1 31	⊙ enters ♏	6 39	5 21	1 34	16	♓	14	8 32	10 20
T.	24	Salome	6 34	5 26	2 37	□ ♆ ⊙ Orion r. 9, 24.	6 40	5 20	2 41	16	♓	27	9 20	11 24
W.	25	Crispin	6 35	5 25	3 40	Regulus rises 9, 38.	6 41	5 19	3 44	16	♈	9	10 4	12 11
T.	26	Amandus	6 36	5 24	4 42	Rigel rises 9 h. 32 m.	6 42	5 18	4 46	16	♈	21	10 54	12 58
F.	27	Sabina	6 37	5 23	5 43	🌕 7* rises 6 h. 2 m.	6 44	5 16	5 48	16	♉	2	11 38	1 36
S.	28	*Sim. Jud.*	6 38	5 22	rises.	**28.** ♅ sets 7, 40.	6 45	5 15	rises.	16	♉	14	morn.	2 12
44) 21. Sunday after Trinity.						**John 4.**	**Day's length**	**10 h. 42 m. South. States.** **10 h. 28 m. Middle States.**						
S.	29	*H. Zwingl.*	6 39	5 21	6 13	♀ rises 3 h. 46 m.	6 46	5 14	6 18	16	♉	26	12 29	2 46
M.	30	Serapion	6 40	5 20	6 57	♄ sets 9 h. 20 m.	6 47	5 13	7 2	16	♊	8	1 34	3 17
T.	31	*Hall. Eve*	6 41	5 19	7 40	♃ rises 11 h. 10 m.	6 48	5 12	7 44	16	♊	20	2 30	3 49

5632. Sept. 30. and Oct. 1. Sucot 2 first days. 6. Hoshaanah Rabah. 7. Sheminee Aseret. 8. Simhat Torah. 15. 16. Rosh Hodesh Heshvan.

Moon's Phases.

SOUTHERN STATES.	dy.	h.	m.	MIDDLE STATES.	dy.	h.	m.
Last Quarter	6	12	23 Aft.	Last Quarter	6	12	41 Aft.
New Moon	14	1	15 Mo.	New Moon	14	1	33 Mo.
First Quarter	20	6	52 Ev.	First Quarter	20	7	10 Ev.
Full Moon	28	3	13 Mo.	Full Moon	28	3	30 Mo.

Conjectures of the Weather.

The 1, 2, 3. pleasant; 4, 5, 6, cloudy and rain; 7, 8, 9, stormy; 10, 11, 12, 13, clear and pleasant; 14, 15, unpleasant; 16, 17. 18, cloudy and rain; 19, 20, fair; 21, 22, warm; 23, 24, 25, changeable; 26, 27, clear and pleasant; 28, 29, inclined to rain; 30, 31, cool and windy.

October, first frost of the year,
Breathes on the last sad summer flower,
And sportsmen, eager with their guns,
Are up with the early morning hour.

Now runs the farmer's cider mill,
And gathering nuts employ the boys;
And though the chilly breezes come,
They touch not yet their Autumn joys.

AUTUMN.

Autumn, somber, grave, and plain,
Woos sweet Summer all in vain;
Useless wooing, for she flies,
Leaving cool September skies.

Then October jogs along,
Brown and steady, with her song,
Till, one cold November day,
Autumn hurries on her way.

"The beauty of holiness, like the sun, is seen by its own light."

NOVEMBER. Calculated for North, East, South and West. 1871.

W. & D.		Month, Days, &c.	Latitude of Southern States. SUN rises h. m.	SUN sets h. m.	MOON r. & s. h. m.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises h. m.	SUN sets h. m.	MOON r. & s. h. m.	S. fast m.	Moon's Signs. s.	d.	Moon south. h. m.	High Water. Phila. h. m.
W.	1	*All Saints*	6 42	5 18	8 37	☽ in Apogee. ☊ ⌒	6 50	5 10	8 29	16	♋	2	3 25	4 21
T.	2	*All Souls*	6 43	5 17	9 27	☌ ☿ ☉ superior.	6 51	5 9	9 19	16	♋	14	4 14	4 54
F.	3	Theophilus	6 44	5 16	10 26	♀ rises 3 h. 39 m.	6 52	5 8	10 18	16	♋	27	5 6	5 31
S.	4	Charlotte	6 45	5 15	11 21	☽ ☌ ♃ ♅ ♃ r. 10, 46.	6 53	5 7	11 16	16	♌	10	5 56	6 13
45)		22. Sunday after Trinity.				Matt. 18.	Day's length		10 h. 30 m. South. States. 10 h. 12 m. Middle States.					
S.	5	Malachi	6 45	5 15	morn.	☾ 5. ♂ sets 7, 28.	6 54	5 6	morn.	16	♌	22	6 40	7 5
M.	6	Leonard	6 46	5 14	12 20	♅ stationary.	6 56	5 4	12 24	16	♍	6	7 29	8 20
T.	7	Engelbert	6 47	5 13	1 30	♄ sets 8 h. 40 m.	6 57	5 3	1 35	16	♍	20	8 16	9 46
W.	8	Cecilia	6 48	5 12	2 29	Regulus rises 8, 44.	6 58	5 2	2 36	16	♎	5	9 2	10 58
T.	9	Theodore	6 59	5 11	3 22	☌ ☽ ♀ ♀ rises 3, 26.	6 59	5 1	3 30	16	♎	20	9 52	11 50
F.	10	*Mart. Luth*	6 50	5 10	4 31	Orion rises 8 h. 22 m.	7 0	5 0	4 39	16	♏	5	10 41	12 20
S.	11	*Mart., B.*	6 51	5 9	5 32	Sirius rises 10, 30.	7 1	4 59	5 41	16	♏	20	11 35	1 1
46)		23. Sunday after Trinity.				Matt. 22.	Day's length		10 h. 16 m. South. States. 9 h. 56 m. Middle States.					
S.	12	Jonas	6 52	5 8	sets.	● 12. ☌ ☽ ☿	7 2	4 58	sets.	16	♐	5	12 0	1 40
M.	13	Winebert	6 53	5 7	6 8	☽ in Perigee.	7 3	4 57	5 59	16	♐	20	12 40	2 21
T.	14	Levin	6 54	5 6	6 55	☿ in Aphelion ☋ ◡	7 4	4 56	6 46	15	♑	5	1 34	3 1
W.	15	Leopold	6 54	5 6	7 52	☽ ☌ ♂ ♄ ♂ sets 7, 10.	7 5	4 55	7 44	15	♑	19	2 36	3 44
T.	16	Ottomarus	6 55	5 5	8 55	☌ ♂ ♄ ♃ stationary.	7 6	4 54	8 46	15	♒	3	3 40	4 29
F.	17	Alpheus	6 56	5 4	9 59	♀ rises 5 h. 19 m.	7 7	4 53	9 51	15	♒	16	4 41	5 22
S.	18	Gelasius	6 57	5 3	11 5	♃ rises 9 h. 53 m.	7 8	4 52	10 59	15	♒	29	5 38	6 17
47)		24. Sunday after Trinity.				Matt. 9.	Day's length		10 h. 6 m. South. States. 9 h. 42 m. Middle States.					
S.	19	*Elizabeth*	6 57	5 3	11 59	☽ 19. 7* so. 12, 7.	7 9	4 51	morn.	14	♓	11	6 31	7 20
M.	20	Amos	6 58	5 2	morn.	Fomal. so. 7, 8.	7 10	4 50	12 0	14	♓	23	7 19	8 41
T.	21	*Off. V. Ma.*	6 59	5 1	12 58	Rigel rises 7 h. 47 m.	7 11	4 49	1 4	14	♈	5	8 4	9 59
W.	22	Alphonsus	6 59	5 1	2 4	♄ sets 7 h. 41 m.	7 12	4 48	2 12	14	♈	17	8 48	11 11
T.	23	Clement	7 0	5 0	3 19	☉ enters ♐	7 12	4 48	3 28	13	♈	29	9 31	12 0
F.	24	Chrisogen.	7 1	4 59	4 32	♂ sets 6 h. 55 m.	7 13	4 47	4 40	13	♉	11	10 16	12 31
S.	25	Catharine	7 1	4 59	5 50	Andromeda. so. 7, 58.	7 14	4 46	5 59	13	♉	29	11 2	1 10
48)		25. Sunday after Trinity.				Matt. 24.	Day's length		9 h. 56 m. South. States. 9 h. 30 m. Middle States.					
S.	26	Conrad	7 2	4 58	rises.	○ 26. ♀ r. 3, 17.	7 15	4 45	rises.	13	♊	5	11 42	1 48
M.	27	Jehoshaph	7 2	4 58	5 39	♃ rises 8 h. 59 m.	7 16	4 44	5 30	12	♊	17	12 30	2 24
T.	28	Guntherus	7 3	4 57	6 21	☊ Sirius r. 9, 28. ⌒	7 17	4 43	6 12	12	♊	29	1 20	2 57
W.	29	Saturn	7 3	4 57	7 9	☽ in Apogee.	7 17	4 43	7 0	12	♋	11	2 11	3 28
T.	30	*S. Andrew*	7 4	4 56	7 54	Arctur rises 2 h 30 m.	7 18	4 42	7 44	12	♋	24	3 2	4 2

5632. 14. Rosh Hodesh Kislev.

Moon's Phases.

Southern States.

	dy.	h.	m.	
Last Quarter	5	7	51	Mo.
New Moon	12	12	6	Aft.
First Quarter	19	3	42	Mo.
Full Moon	26	8	48	Ev.

Middle States.

	dy.	h.	m.	
Last Quarter	5	8	11	Mo.
New Moon	12	12	24	Aft.
First Quarter	19	4	0	Mo.
Full Moon	26	9	6	Ev

Conjectures of the Weather.

The 1, 2, 3, 4, changeable; 4, 5, clear and cold; 6, 7, 8, soultry and rain; 9, 10, 11, moderate; 12, 13, 14, clear and pleasant; 15, 16, 17, cool; 18, 19, cloudy and rain; 20, 21, pleasant; 22, 23, 24, clear and dry; 25, 26, 27, damp and unpleasant weather; 29, 30, storm and rain.

But now November's surly blast
Speaks loudly of the cheery fire,
And makes us, as it howls about,
Unto the grateful blaze draw nigher.

The falling leaves, a sad remind
That winter days have come again,
Whirl through the air in countless troops,
And rattle on the window pane.

THE MYSTERY.

"One story more," the whole world cried.
The great magician smiled in doubt:
"I am so tired that, if I tried,
I fear I could not tell it out."

"But one is all we ask," they said:
"You surely can not faint nor fail."
Again he raised his weary head,
And slow began the witching tale.

The fierce debater's tongue grew mute,
Wise men were silent for his sake;
The poet threw aside his lute,
And paused enraptured while he spake.

The proudest lady in the land
Forgot that praise and power were sweet;
She dropped the jewels from her hand,
And sat enchanted at his feet.

Lovers, with clasped hands lightly prest,
Saw Hope's sweet blossoms bud and bloom;
Men, hastening to their final rest,
Stopped, half-enraptured with the tomb.

Children, with locks of brown and gold,
Gathered about like flocks of birds;
The poor, whose story he had told,
Drew near and loved him for his words.

His eye burns bright, his voice is strong,
A waiting people eager stands;
Men on the outskirts of the throng
Interpret him to distant lands.

When lo! his accents, faltering, fall;
The nations, awe-struck, hold their breath;
The great magician, loved of all.
Has sunk to slumber, tired to death!

His human eyes in blind eclipse
Are from the world for ever sealed;
The "Mystery" trembling on his lips
Shall never, never be revealed.

Yet who would miss that tale half told,
Though weird and strange, or sweet and true;
Who care to listen to the old,
If he could hear the strange and new?

Alas! alas! it can not be;
We too must sleep and change and rise,
To learn the eternal mystery
That dawned upon his waking eyes!

◆

CORRELATION OF COLOR AND MUSIC.

The wave lengths of sound in each successive note of the musical scale, from C up to its octave, it is well known, vary in a certain order, and the wave-length of C is twice that of its octave. W. F. Barrett has lately discovered and demonstrated, what others before had suspected, that the wave-lengths of each color in the solar spectrum vary in the same order and ratios, and that the wave-length of the violet end is in like wise half the wave-length of the red end. The mean wave-length of red, measured in ten millionths of a millimetre, is 6,853. The wave-length of the sound middle C is 52 inches. Now, call the wave-length of red 100, and the wave-length of C also 100, and the discovery is that as C corresponds to red, so does D correspond to orange in the diminution of the wave-length, and so does E to yellow, F to green, so does the the mean of the blue and indigo wave-length diminish as the wave-length of the sound G is by observation found to have diminished. A corresponds to violet, and B to ultra-violet. The table below makes the matter plainer:

COLOR.	RATIO.	NOTES.	RATIO.
Red,	100	C	100
Orange,	89	D	89
Yellow,	81	E	81
Green,	75	F	75
Blue, 69 Indigo, 64 } mean	67	G	67
Violet,	60	A	60
[Ultra-violet]	53	B	53
[Obscure]	50	C 2	50

The musical scale is thus literally a rainbow of sound, as the solar spectrum is a melodious scale of color; and harmony in color and music may thus probably be found to have a common physical basis.

◆

THE DATE OF THE CRUCIFIXION.

Herr Falb, the German *savant*, in a work recently published, shows that there was a total eclipse of the moon concomitantly with the earthquake that occurred when Julius Cæsar was assassinated, on the 15th of March, B.C. 44. He has also calculated back the Jewish calender to A.D. 31, and the result of his researches fully confirms the facts recorded by the Evangelists of the wonderful physical events that accompanied the Crucifixion. Astronomical calculations prove, without a shadow of a doubt, that on the 14th day of the Jewish month, Nisan, (April 6th) there was a total eclipse of the sun, which was accompanied, in all probability, by the earthquake when "the veil of the Temple was rent in twain from the top to the bottom, and the earth did quake and rocks rent," (Matt. xxvii. 51); while St. Luke describes the eclipse in these words: "And it was about the sixth hour (12 noon), and there was darkness over all the land till the ninth hour (3 o'clock p.m.), and the sun was darkened." (Luke xxii. 44.) This mode of reckoning corresponds perfectly with the result of another calculation our author made by reckoning backwards from the great total eclipse of April 20, 1818, allowing for the difference between the old and new styles, which also gives April 6th as the date of the new moon in the year A.D. 31. As the vernal equinox of that year fell on March 25th, and the Jews ate their Easter Lamb, and celebrated their *Erib Pasah*, or Feast of the Passover, on the following new moon, it is clear April 6th was identical with Nisan 14 of the Jewish calendar, which, moreover, was on a Friday, the *Paraskevee*, or day of preparation for the Sabbath, and this agrees with the Hebrew Talmud. Thus, by the united testimony of astronomy, archæology, tradition, and Biblical history, there can be but little doubt that the date of the Crucifixion was April 6th, A.D. 31.

"No rank can shield us from the impartiality of Death."

DECEMBER. Calculated for North, East, South and West. 1871.

W. & D	Month. Days. &c.		Latitude of Southern States. SUN rises & sets.		MOON r. & s.	Aspects of Planets and other Miscellanies.	Latitude of Middle States. SUN rises & sets.		MOON r. & s.	S. fast	Moon's Signs.		Moon south.	High Water. Phila.
			h. m.	h. m.	h. m.		h. m.	h. m.	h. m.	m	s.	d.	h. m.	h. m.
F.	1	Longinus	7 5	4 55	8 59	♃ rises 8 h. 30 m . ◠	7 19	4 41	8 49	11	♌	6	3 40	4 36
S.	2	Candidus	7 6	4 54	10 10	☌ sets 6 h. 44 m.	7 19	4 41	9 59	10	♌	19	4 31	5 14
49) 1. Sunday in Advent.						**Matt. 21.**	**Day's length { 9 h. 48 m. South. States. 9 h. 20 m. Middle States.**							
S.	3	Cassianus	7 6	4 54	10 51	♄ sets 6 h. 59 m.	7 20	4 40	10 40	10	♍	2	5 10	5 54
M.	4	Barbara	7 7	4 53	11 27	Sirius r. 8, 50.	7 20	4 40	11 19	10	♍	16	5 50	6 40
T.	5	Abigail	7 7	4 53	morn.	🌗 **5.** ☿ gr. Hel. Lat. S	7 21	4 39	morn	9	♎	0	6 30	7 35
W.	6	*St. Nichol.*	7 7	4 53	12 29	♀ gr Elong. West.	7 21	4 39	12 36	9	♎	14	7 28	8 48
T.	7	Agathon	7 8	4 52	1 50	Orion rises 6 h. 28 m.	7 22	4 38	1 58	8	♎	29	8 26	9 58
F.	8	*C. V. Mary*	7 8	4 52	3 7	☌ ☽ ♀ ♀ rises 3, 20.	7 22	4 38	3 19	8	♏	14	9 16	11 5
S.	9	Joachim	7 8	4 52	4 12	7* south 10 h. 36 m.	7 23	4 37	4 23	8	♏	28	10 12	11 57
50) 2. Sunday in Advent.						**Luke 21.**	**Day's length { 9 h. 44 m. South. States. 9 h. 14 m. Middle States.**							
S.	10	Judith	7 8	4 52	5 18	♃ rises 7 h. 51 m.	7 23	4 37	5 30	7	♐	14	11 0	12 25
M	11	Barsabas	7 9	4 51	sets.	🌑 **11.** ♄ ☿ ☌ ☋ ◡	7 23	4 37	sets.	7	♐	28	11 34	1 18
T.	12	Otilia	7 9	4 51	5 28	☽ in Perigee.	7 24	4 36	5 15	6	♑	13	12 16	1 59
W.	13	Lucian	7 9	4 51	6 27	☽ ☌ ♄ ☿ ♄ sets 6, 0.	7 24	4 36	6 16	6	♑	26	1 20	2 45
T.	14	Nicasius	7 9	4 51	7 31	♀ in Perihelion ☌ ☽ ⛢	7 24	4 36	7 20	5	♒	11	2 25	3 37
F.	15	Ignatius	7 10	4 50	8 38	☿ gr. Elong. East.	7 24	4 36	8 26	5	♒	24	3 27	4 26
S.	16	Ananias	7 10	4 50	9 41	☿ sets 6 h. 0 m.	7 25	4 35	9 31	4	♓	7	4 24	5 16
51) 3. Sunday in Advent.						**Matt. 11.**	**Day's length { 9 h. 40 m. South. States. 9 h. 10 m. Middle States.**							
S.	17	Lazarus	7 10	4 50	10 48	♀ rises 3, 27.	7 25	4 35	10 38	4	♓	20	5 15	6 10
M.	18	Arnoldus	7 10	4 50	11 49	🌓 **18.** ♃ rises 7, 2.	7 25	4 35	11 40	3	♈	2	6 2	7 2
T.	19	Abraham	7 11	4 49	morn	Wega sets 9 h. 27 m.	7 25	4 35	morn	3	♈	13	6 47	8 4
W.	20	*Emberday*	7 11	4 49	12 40	Regulus rises 9, 23.	7 25	4 35	12 48	2	♈	25	7 31	9 11
T.	21	Thomas, A.	7 11	4 49	1 42	Sirius rises 7 h. 30 m.	7 25	4 35	1 50	2	♉	8	8 14	10 20
F.	22	Beata	7 12	4 48	2 44	☉ ent. ♑ short. day.	7 26	4 34	2 56	1	♉	19	8 58	11 23
S.	23	Dagobert	7 11	4 49	3 47	*Winter commences.*	7 25	4 35	3 59	1	♊	1	9 42	12 1
52) 4. Sunday in Advent.						**John 1.**	**Day's length { 9 h. 38 m. South. States. 9 h. 10 m. Middle States.**							
S.	24	Adam, Eve	7 11	4 49	4 58	Orion rises 5 h. 10 m.	7 25	4 35	5 10	slow.	♊	12	10 28	12 42
M.	25	*Christmas*	7 11	4 49	6 12	☊ ♀ rises 3, 31. ◠	7 25	4 35	6 24		♊	24	11 16	1 22
T.	26	Stephen	7 10	4 50	rises.	🌕 **26.** ☽ in Apo.	7 25	4 35	rises.	1	♋	7	morn	2 1
W.	27	*John, Ev.*	7 10	4 50	5 47	7* south 9 h. 17 m.	7 25	4 35	5 35	1	♋	19	12 10	2 40
T.	28	H. Innoc.	7 10	4 50	6 49	☽ ☌ ♄ ♅ ♃ rises 6, 29.	7 25	4 35	6 39	2	♌	3	1 14	3 14
F.	29	Noah	7 10	4 50	7 53	Rigel south 10, 36.	7 25	4 35	7 42	2	♌	15	2 16	3 46
S.	30	*N Copern.*	7 9	4 51	8 59	⛢ in Perihelion.	7 24	4 36	8 50	3	♌	29	3 8	4 26
53) Sunday after Christmas.						**Luke 2.**	**Day's length { 9 h. 42 m. South. States. 9 h. 12 m. Middle States.**							
S.	31	Sylvester	7 9	4 51	10 8	☉ in Perigee.	7 24	4 36	9 58	3	♍	13	4 0	4 58

5632. 5. Barech Alenu. 8. Hanucah, 1. day. 13. Rosh Hodesh Tebet. 22. Fast of Tebet.

Moon's Phases

	Southern States.			Middle States.		
	dy.	h.	m.	dy.	h.	m.
Last Quarter	5	1	36 Mo.	5	1	54 Mo.
New Moon	11	10	47 Ev.	11	11	7 Ev.
First Quarter	18	3	26 Aft.	18	3	44 Aft.
Full Moon	26	4	15 Ev.	26	4	33 Ev.

Conjectures of the Weather.

The 1, 2, clear and cold; 3, 4, changeable; 5, 6, 7, rough winds; 8, 9, pleasant; 10, 11, clear and cold; 12, 13, rain or snow; 14, 15, clear and pleasant; 16, 17, changeable; 18, 19, 20, clear and cold; 21, 22, rough winds; 23, 24, 25, cool and pleasant; 26, 27, cloudy; 28, 29, cold; 30, 31, rain or snow.

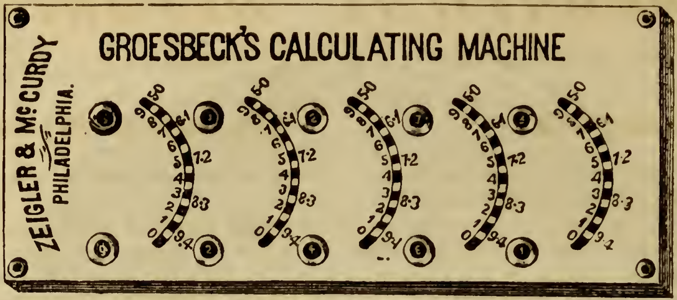
And then December, old and gray,
Sweeps like a specter o'er the land,
Locks up the earth, and makes his way,
With Joy and Woe on either hand.

He brings old Christmas in his train,
With feasting, laughing, dance and song;
But for the poor, alas! he brings
Famine and shivering cold along.

WINTER.

Last comes WINTER, grim and gaunt,
Bringing famine, cold, and want;
Bringing blithe DECEMBER cheer,
Ushering in the gay New Year.

JANUARY, month of mirth,
With its joys about the hearth;
FEBRUARY lovers pine—
Sacred to St. Valentine.



"SILVER PLATED BRAINS."

Such was the exclamation of one who watched the operations of the very useful machine which is represented in the cut above. A little girl, twelve years of age, was using it, and the results were obtained so easily and quickly that the mental processes of most persons were far surpassed. That an unconscious machine should perform what was considered the labor of pure intelligence, seemed wonderful, and somewhat paradoxical. Yet there it was, giving instantaneous additions of from one to five columns of figures at a time, or finding the difference between two numbers, or the columns on the two sides of a Ledger account, without any mental exertion on the part of the operator. There was no effort of memory, no trouble in carrying or borrowing, for the machine did all this for itself. Said a person present, as he handed several long columns to the operator, "Please add these for me; I have added them mentally over and over again, and get a different result each time, and my Trial Balance does not come out right." The correct result was soon announced. Long columns offered no difficulty to the rapid and precise movements of a machine that is not affected by interruptions, that never suffers from headache, never becomes tired, and never adds wrong. What a relief to the hard-worked and wearied brain of the mathematician or man of business!

As addition constitutes the greater part of all the calculations of business and common life, a machine that so easily, rapidly, and accurately performs this tedious and fatiguing task, thus relieving the mind, preventing mistakes, and affording the luxury of feeling that its results are correct and perfectly reliable, is a public benefit. To merchants, bankers, clerks, accountants, lumber and coal dealers, auditors, freight agents, pay-roll keepers, and to business men of all kinds; to men of science, and to all who have to encounter wearisome columns of figures, it will be invaluable. Teachers will find it useful in illustrating the carrying of tens, hundreds, &c., editors and politicians in footing up election returns, government officials in working out the calculations connected with the census, or taxes, or the State or national debt.

The inventor is J. Groesbeck, the Principal of the long-established and widely known Crittenden Philadelphia Commercial College, and the author of the popular Crittenden Commercial Arithmetic and Business Manual, of which ten large editions have been sold in a short time. He has been engaged for years in all kinds of business calculations, and is, therefore, fully competent to judge of what is adapted to the wants of business men.

This Machine is beautifully silver-plated, and is about six inches in length, two and a half in width, and a quarter of an inch in depth, a convenient size for use or carrying about. Its size, beauty, simplicity, cheapness, rapidity, and accuracy will cause it to come into general use, and be one of the requisites of every well furnished office and counting-room. It is sold at the low price of six dollars. Where no agents have been appointed, it will be sent on receipt of the price; or it will be sent on receipt of one dollar as a guarantee that it will be taken, the other five dollars to be paid to the express agent. It is patented, and the right of sale is held by Ziegler & McCurdy, the enterprising publishers, who appoint agents on the most liberal terms. They may be addressed for Circulars, Terms, or information, at either of their offices, which are in Philadelphia, Cincinnati, Chicago, St. Louis, and Springfield, Mass.

MATHEMATICAL DEPARTMENT.

ARTEMAS MARTIN, Editor, McKean, Erie Co., Pa., to whom all communications should be addressed.

SALUTATORY.

BELIEVING that a mathematical annual similar to those published in Europe would cover ground unoccupied in this country, and prove acceptable to persons interested in the delightful study of mathematical science, we have ventured to put one forth.

The interest manifested in the mathematical department of "Our Schoolday Visitor" is abundant evidence that such literature is beginning to be appreciated.

The principal of an institution of learning in Pennsylvania recently informed us that it was the problems published in the "Saturday Evening Post," many years ago, that first awakened in him a thirst for knowledge; and we take this opportunity to acknowledge our own indebtedness to that paper.

More than twenty years ago a writer in the "Lady's and Gentleman's Diary," published in London, England, pp. 84, 85, said:

"I confess it to be my belief, from a limited observation of graduates and non-graduates, that when the difference between the prizes awarded by the authorities on either side is considered, an incomparably greater share of the glory of kindling and cherishing a pure and lasting love of mathematical science in *men* as well as *boys*, must be attributed to the immortal Lady Dia,* than to all the universities and colleges of these kingdoms put together."

We do not expect so much will ever be claimed for *our* Annual, but we shall endeavor, to the best of our ability, to make it interesting and instructive. To this end we invite the mathematicians of this country and Europe to contribute to its pages problems, solutions, queries, and other interesting items.

In order to induce emulation the following prizes will be awarded for solutions of the problems proposed in this number:

For the best solution of the prize problem, ten copies of the Almanac; and for the second best solution, eight copies: for the best solutions to the greatest number of the problems proposed, ten copies; and for the second greatest number, eight copies.

Solutions and all other matter intended for publication in the next number must arrive before August 1st, 1871.

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* Lady's and Gentleman's Diary.

THE "CARPENTER'S THEOREM."

BY WILLIAM H. JOHNSON, Newtown, Bucks Co., Pa.

IN that period of Grecian history when the science of Geometry had not given to its professors a world-wide reputation, we are told that one distinguished man left his name in an elevated position on the stairway of that science. It was common, in those days, for the learned to refer their discoveries to a god or goddess, who was supposed to preside over some department of intelligence in which its votaries were engaged. When any great discovery or invention was brought to light, the fortunate devotee was forthwith credited with an immediate communication from the inspiring deity, and he was considered in duty bound to return thanks for the favor conferred; hence, when Pythagoras discovered the important fact that the sum of the squares described on the two sides of a right-angled triangle was equal to that on the hypothenuse, it was believed that he had incurred a debt to Apollo that could be cancelled by some magnificent sacrifice alone; and it appears from the history of the transaction that a hecatomb of a hundred bullocks was the gift offered on this occasion.

It would appear that the science of Geometry must have been in an almost infant state when such a proposition was wanting in its archives; for, in the present advanced state of geometrical investigations, this proposition is considered so fundamental that little progress can be made in any direction, without employing the principles which it involves.

It appears that Euclid (who was a disciple of Socrates) collected the scattered truths of Geometry of his time into a system, entitled "Elements of Geometry," which has ever since borne his name, and published his treatise when the science was in an advanced state;* and his "Elements" still continue to hold a place in the first mathematical schools in this country and in Europe. It is true the application of analysis has greatly shortened investigations involving geometrical principles, and the work is now pretty much laid aside as a class-book; still it holds a prominent position in every mathematical library, as an indispensable book of reference.

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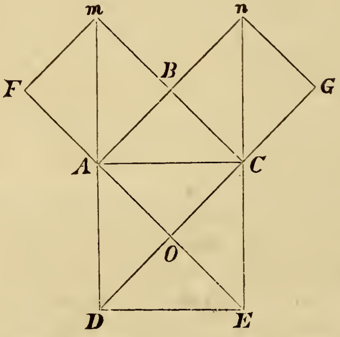
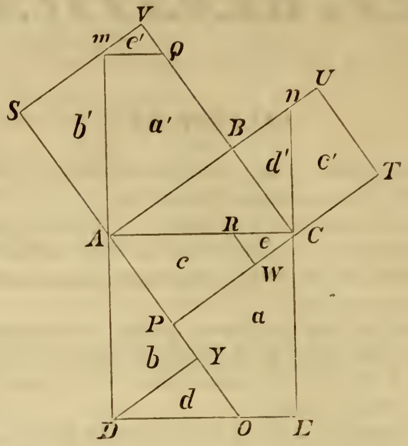
* It is estimated that Euclid flourished nearly three hundred years after Pythagoras.

The proposition to which I have alluded has been long known as *Euclid's 47th*, in the first book of the "Elements." The prominence of this proposition sufficiently indicates its importance as containing preliminary truths in mathematical demonstrations; but its practical application to mechanical operations is exemplified by the name selected for it in our caption. It is called the "Carpenter's Theorem," because of its application in various cases where measurement is concerned, such as the tool called a *square*, the *chalk-line*, &c., but especially in the squaring of buildings, in which it serves the wants of the mason as well as the carpenter. Every one may know that with a 10 feet pole as a hypothenuse, the lines 6 and 8 feet being drawn to its two ends, will enclose a right angle; or that 6 and 8 feet being so separated as to contain a right angle, will require for its subtense exactly 10 feet; and hence the obvious process of laying out rectangular foundations for building, or of making a right angle by the carpenter's or mason's square, which is an indispensable tool in their respective trades.

This subject will be further illustrated by some ocular demonstrations of the truth of the proposition, as announced in that to which I have referred. Two diagrams have been selected, which, together, embrace all the cases that can possibly occur. The former illustrates the proposition for every isosceles right-angled triangle. The latter represents the principle as applied to such triangles without any limitation.



Let ABC, *Fig.* 1, be any isosceles right-angled triangle. On the hypothenuse AC describe the square ACDE, and on AB, BC, the equal squares ABFm, BCnG. Produce DA, EC, to m, n, and each will be divided into two equal triangles. Join AE and DC. These diagonals will evidently divide the square ACDE into four equal triangles, each equal to one of the four into which the two small squares are divided. Hence the truth of the theorem is manifest.



Let ABC, *Fig.* 2, be any right-angled triangle whose legs, AB, BC, are unequal. On the several sides describe the squares ABSV, BCUT, ACDE. Produce DA, EC to meet SV, BU in *m*, *n* respectively. Also produce SA to meet DE in O, and TC to meet AO in P. Draw DY perpendicular to AO. Through *m* draw *m*Q parallel to AC. Take RC = *m*Q, and draw RW perpendicular to PC.

These lines divide the squares on the legs into five pieces, and the square on the hypothenuse also into five pieces, and the pieces are *identical*, as may be readily seen by comparing those marked a, a^1; b, b^1; &c.

Consequently the truth of the theorem is established for all right-angled triangles.

* * *

PRACTICAL THOUGHTS ON MATHEMATICS.

By J. M. Greenwood, Kirksville, Adair Co., Mo.

It is claimed for mathematics that it produces results not attainable in the other departments of classified knowledge. Alone it stands as an immutable truth, scarcely borrowing from any science, yet lending to all, and in lending is not impoverished. No science is so exacting, because "its logic is the logic of thought." While it stimulates and strengthens the perceptive and reflective faculties at every step onward, thus gathering additional power by the very effort, it elevates and ennobles the moral nature of man, and also restrains the grosser propensities by raising him above the strife and confusion incident to life and its busy scenes.

Can a man be found with a soul so dead as not to admire the kindness and fraternal love manifested by the French and English mathematicians during the bloody wars that followed the French Revolution of 1792? According to the usages of war, private correspondence was interdicted, yet they sought every opportunity of informing each other of new discoveries being made in their respective countries without referring to that grim monster which was filling both nations with sadness and gloom.

All is not passionless abstraction, for there is a practical utility in mathematics, when guided by the mind of man, that overcomes the power of the elements, and annihilates time and space. A few principles of mathematics practically applied have done more toward uniting the nations of the earth in one common brotherhood than all other human agencies combined. The railway and the steamship, where constructed by the skill of man, and controlled by his intelligence, encircle the world, linking nation to nation and continent to continent, unlocking the bars and bolts of the "Land of Mysteries," and establishing commercial relations with "the East by the way of the West."

The day-dream of the ancient Egyptian was realized by the engineer of the nineteenth century who connected the Mediterranean and the Red Sea, and in a few years more the waves of the Atlantic and Pacific, in their uneasy slumbers, will roll through the canal of Panama.

The mathematician weighs the dust of the earth, and comprehends the size of the mountain; he determines the arch that spans the river, and the bridge that will cross the Strait of Dover; he it is who chronicles the birth and death of far-off worlds; he ascertains the average of human life, and predicts the power of the missiles of death; he proves the authenticity of the Bible and history by the eclipses of the sun; he goes every where, questions every thing—only mind itself, and reasons "from nature" up to the center of the universe which is the Throne of God.

PLANETARY WORLDS.

The whole number of primary planets now recognized in the solar system is 114. Of this number only 6 were known prior to 1~~87~~781, when Sir William Herschel discovered the remote planet Uranus, adding the first new string to the old "Lyre of Heaven." The unwearied industry of astronomers, with the powerful aid of the telescope, has added 107 planets to the list since that time. Every American must feel a pride in the fact that nearly one-fifth of these planets were discovered in the United States.

A New Method of Solving Cubic Equations.

By Daniel Kirkwood, Professor of Mathematics, Indiana State University, Bloomington, Ind.

It is well known that every cubic equation may be reduced to the form

$$x^3+ax=b \quad . \; . \; . \; . \; . \; . \; . \; . \; . \quad (1),$$

in which the second power is wanting.

Putting $x=\sqrt[3]{y}-\frac{a}{3\sqrt[3]{y}}$, (1) becomes

$$y^2-by=\left(\frac{a}{3}\right)^3.$$

This method of solving cubics (which is new to the writer) is more simple than that of Cardan. It fails, however, where Cardan's formula is inapplicable.

Example.—Given $x^3+x=1$, to find x.

Here the transformed equation is

$$y^2-y=\frac{1}{27};$$

hence $y=\frac{1}{2}\left(1\pm\sqrt{\frac{31}{27}}\right)$; whence x is readily found.

On the Resolution of Equations by "Reversion of Series."

By Artemas Martin.

In the year 1855, Joseph B. Mott, of Dowagiac, Cass Co., Mich., published a pamphlet entitled "Mathematical Key," in which he claims as original, under the name of "General Root Theorem," the method of solving equations by "Reversion of Series." In his preface, he says: "As it respects *the general root theorem*, I claim both the discovery and invention of it as my own. If any other person has made a similar discovery, it must be a late occurrence, and is wholly unknown to me."

The above claim, however, is easily set aside. The "Lady's and Gentleman's Diary," for 1852, published in London, contained an elaborate article on this method of solving the higher equations. Besides, "Reversion of Series" was applied to the solution of equations *more than one hundred years ago.* In proof of this assertion I refer the reader to "Leybourn's Lady's Diary," Vol. II, pp. 113, 189, 204 and 222, where it was employed as early as 1756; and it was known prior to that date, as may be seen by consulting previous numbers of the same periodical.

This method may be employed with advantage in the solution of equations of the higher orders, and also in the resolution of transcendental equations.

Let $a=x+bx^2+cx^3+dx^4+ex^5+fx^6+gx^7+\&c. \;.\; (1)$, and assume

$x=a+Aa^2+Ba^3+Ca^4+Da^5+Ea^6+Fa^7+\&c. \;.\; (2)$.

Then $bx^2=ba^2+2bAa^3+(bA^2+2bB)a^4+\&c.$;

$$cx^3= \qquad ca^3+3cAa^4+\&c.;$$

$$dx^4= \qquad da^4+\&c.;$$

$$\&c., \quad \&c., \quad \&c., \quad \&c.$$

By addition,

$x+bx^2+cx^3+dx^4+\&c.=a+(A+b)a^2+(B+2bA+c)a^3+(C+bA^2+2Bb+3cA+d)a^4+\&c. \;.\;.\;.\;.\; (3)$.

In order that (1) and (3) may be identical, we must have

$$A+b=0. \;.\;.\; (4) \qquad B+2bA+c=0. \;.\;.\;.\; (5),$$

$$C+bA^2+2bB+3cA+d=0. \;.\;.\;.\;.\; (6),$$

$$\&c., \quad \&c., \quad \&c., \quad \&c.$$

These equations give $A=-b$, $B=2b^2-c$, $C=-5b^3+5bc-d$; and by extending the substitution, we find

$D=14b^4-21b^2c+6bd+3c^2-e$,

$E=-42b^5+84b^3c-28b^2d-28bc^2+7be+7cd-f$,

$F=132b^6-330b^4c+120b^3d+180b^2c^2-36b^2e-72bcd+8bf+8ce-12c^3+4d^2-g$.

Therefore one value of x in the equation $a=x+bx^2+cx^3+dx^4+ex^5+fx^6+gx^7+\&c.$, is

$$x=a-ba^2+(2b^2-c)a^3-(5b^3-5bc+d)a^4 +(14b^4-21b^2c+6bd+3c^2-e)a^5 -(42b^5-84b^3c+28b^2d+28bc^2-7be-7cd+f)a^6 +(132b^6-330b^4c+120b^3d+180b^2c^2-36b^2e-72bcd +8bf+8ce-12c^3+4d^2-g)a^7-\&c. \;.\;.\;.\;.\;.\;.\; (7).$$

To apply (7) to the solution of the quadratic $a=x+bx^2$, make $c=0$, $d=0$, $e=0$, &c., and we have

$$x=a-ba^2+2b^2a^3-5b^3a^4+14b^4a^5-42b^5a^6+132b^6a^7 -\&c. \;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\;.\; (8).$$

Example.—Find x from the equation

$$x^2-12x=-3.$$

Transposing and dividing by 12,

$$\frac{1}{4}=x-\frac{1}{12}x^2.$$

Here $a=\frac{1}{4}$, $b=-\frac{1}{12}$, and

$$x=\frac{1}{4}+\frac{1}{192}+\frac{1}{4608}+\frac{5}{442368}+\&c.=0.25543+.$$

The sum of the roots of the equation $a=x+bx^2$ is $=-\frac{1}{b}$; hence we have for the other value,

$x=-\frac{1}{b}-a+ba^2-2b^2a^3+5b^3a^4-14b^4a^5+42b^5a^6-$ &c. The other root of our example is, therefore, 11.74456+.

The value of x determined by (7) is the *least* root of the equation

$$a=x+bx^2+cx^3+dx^4+ex^5+\&c.$$

When the roots are all imaginary, the value of x given by (7) will be infinite.

Let it be required to find x from the equation

$$1=x-x^2.$$

Making $a=1$, and $b=-1$, (8) gives

$$x=1+1+2+5+14+42+132+\&c.$$

By the common rule, $x=\frac{1}{2}\pm\frac{1}{2}\sqrt{-3}$.

For cubics, we have $d=0$, $e=0$, $f=0$, &c., and

$$x=a-ba^2+(2b^2-c)a^3-(5b^3-5bc)a^4+(14b^4-21b^2c+3c^2)a^5-(42b^5-84b^3c+28bc^2)a^6+(132b^6-330b^4c+180b^2c^2-12c^3)a^7-\&c. \;.\;.\;.\;.\;.\;.\;.\;.\; (9);$$

and when $b=0$,

$$x=a-ca^3+3c^2a^5-12c^3a^7+\&c. \;.\;.\;.\;.\; (10).$$

Examples.—1. Given $2x^3-72x^2+1240x=7201$, to find x.

In order to bring this equation to a more convenient form, let $y+10=x$.

By substitution and reduction, we obtain

$$2y^3-12y^2+400y=1.$$

Transposing and dividing by 400,

$$\frac{1}{400}=y-\frac{3}{100}y^2+\frac{1}{200}y^3.$$

Making $a=\frac{1}{400}$, $b=-\frac{3}{100}$, and $c=\frac{1}{200}$ in (9),

$$y=\frac{1}{400}+\frac{3}{16000000}-\frac{1}{20000000000}+\&c.$$

$$=0.00250018744+.$$

$$x=y+10=10.00250018744+.$$

The other values are imaginary.

2. Given $x^3-12x=-2$, to find x.

Transposing and dividing by 12,

$$x-\frac{x^3}{12}=\frac{1}{6}.$$

Putting $a=\frac{1}{6}$, and $c=-\frac{1}{12}$ in (10), we have

$$x=\frac{1}{6}+\frac{1}{2592}+\frac{1}{2239488}+\&c.=0.16705291+.$$

To find another root, let $y+\frac{10}{3}=x$; and by substitution and reduction we have

$$\frac{13}{288}=y+\frac{15}{32}y^2+\frac{3}{64}y^3.$$

Now $a=\frac{13}{288}$, $b=\frac{15}{32}$, $c=\frac{3}{64}$, and (9) gives

$$y=\frac{13}{288}-\frac{845}{884736}+\frac{147199}{4076863488}-\&c.=0.04511+.$$

$$\therefore x_1=y+\frac{10}{3}=3.3784+.$$

$$x_2=12-x-x_1=8.4545.$$

For equations of the fourth degree, put $e=0$, $f=0$, $g=0$, &c., and then

$$x=a-ba^2+(2b^2-c)a^3-(5b^3-5bc+d)a^4+(14b^4-21b^2c+6bd+3c^2)a^5 -(42b^5-84b^3c+28b^2d+28bc^2-7cd)a^6 +(132b^6-330b^4c+120b^3d+180b^2c^2-72bcd-12c^3+4d^2)a^7-\&c. \;.\;.\;.\;.\;.\;.\;.\;.\; (11).$$

When the co-efficient of x^2 is wanting,

$$x=a-ca^3-da^4+3c^2a^5+7cda^6-(12c^3-4d^2)a^7 \;\&c. \qquad (12).$$

From $a=x+bx^2+dx^4$ we obtain

$$x=a-ba^2+2b^2a^3-(5b^3+d)a^4+(14b^4+6bd)a^5$$
$$-(42b^5+28b^2d)a^6+(132b^6+120b^3d+4d^2)a^7-\&c. \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (13).$$

If $a=x+cx^3+ex^5+gx^7+\&c.$, (7) gives (putting $b=0$, $d=0$, $f=0$, &c.,)

$$x=a-ca^3+(3c^2-e)a^5-(12c^3-8ce+g)a^7+\&c. \quad (14)$$

Other modifications can be made, when necessary, to suit any particular case that may arise in practice.

When the first power of the unknown quantity is wanting, substitute $r+y$ for x.

In most cases the proposed equation may be so transformed that three or four terms of the series will give the value of the root to a sufficient degree of accuracy.

To revert a series of the form

$$a=x^n+bx^p+cx^r+dx^s+ex^t+\&c.,$$

extract the n^{th} root of it by the "Multinomial Theorem, and then proceed as in other cases.

Example.—Find x from

$$a^3=x^3+\tfrac{1}{2}x^4+\tfrac{1}{3}x^5+\tfrac{1}{4}x^6+\&c.$$

Extracting the cube root of both sides,

$$a=x+\frac{1}{6}x^2+\frac{1}{12}x^3+\frac{35}{648}x^4+\&c.$$

whence $x=a-\dfrac{1}{6}a^2-\dfrac{1}{36}a^3-\dfrac{5}{648}a^4-\&c.$

If space would permit, we might give examples in equations of the fourth, fifth, and higher degrees; but we will only add a couple of examples in transcendental equations.

1. Solve the equations $x+y=2a$, $x^{\sqrt2}+y^{\sqrt2}=b$, and find the values of x and y when $a=5$ and $b=20$.

Solution.

Let $a+z=x$, and $a-z=y$. Then by substitution, $(a+z)^{\sqrt2}+(a-z)^{\sqrt2}=b. \quad . \; . \quad (3).$

By the "Binomial Theorem,"

$$(a+z)^{\sqrt2}=a^{\sqrt2}+\sqrt2.a^{\sqrt2-1}z+\frac{\sqrt2(\sqrt2-1)}{1.2}a^{\sqrt2-2}z^2+\frac{\sqrt2(\sqrt2-1)(\sqrt2-2)}{1.2.3}a^{\sqrt2-3}z^3+\frac{\sqrt2(\sqrt2-1)(\sqrt2-2)(\sqrt2-3)}{1.2.3.4}a^{\sqrt2-4}z^4+\&c.,$$

and

$$(a-z)^{\sqrt2}=a^{\sqrt2}-\sqrt2.a^{\sqrt2-1}z+\frac{\sqrt2(\sqrt2-1)}{1.2}a^{\sqrt2-2}z^2-\frac{\sqrt2(\sqrt2-1)(\sqrt2-2)}{1.2.3}a^{\sqrt2-3}z^3+\frac{\sqrt2(\sqrt2-1)(\sqrt2-2)(\sqrt2-3)}{1.2.3.4}a^{\sqrt2-4}z^4-\&c.$$

Adding and dividing by 2,

$$a^{\sqrt2}+\frac{\sqrt2(\sqrt2-1)}{1.2}a^{\sqrt2-2}z^2+\frac{\sqrt2(\sqrt2-1)(\sqrt2-2)(\sqrt2-3)}{1.2.3.4}a^{\sqrt2-4}z^4+\frac{\sqrt2(\sqrt2-1)(\sqrt2-2)(\sqrt2-3)(\sqrt2-4)(\sqrt2-5)}{1.2.3.4.5.6}a^{\sqrt2-6}z^6=\frac{b}{2} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; (4).$$

Transposing $a^{\sqrt2}$ and dividing by $\dfrac{\sqrt2(\sqrt2-1)}{1.2}a^{\sqrt2-2}$,

$$z^2+\frac{(\sqrt2-2)(\sqrt2-3)}{3.4a^2}z^4+\frac{(\sqrt2-2)(\sqrt2-3)(\sqrt2-4)(\sqrt2-5)}{3.4.5.6a^4}z^6+\frac{(\sqrt2-2)(\sqrt2-3)(\sqrt2-4)(\sqrt2-5)(\sqrt2-6)(\sqrt2-7)}{3.4.5.6.7.8a^6}z^8$$
$$+\frac{(\sqrt2-2)(\sqrt2-3)(\sqrt2-4)(\sqrt2-5)(\sqrt2-6)(\sqrt2-7)(\sqrt2-8)(\sqrt2-9)}{3.4.5.6.7.8.9.10a^8}z^{10}$$
$$+\&c.=\frac{(b-2a^{\sqrt2})a^{2-\sqrt2}}{2-\sqrt2}=2.2917497+ \quad . \quad (5).$$

Performing the indicated multiplications of the radicals,

$$z^2+\left(\frac{8-5\sqrt2}{3.4a^2}\right)z^4+\left(\frac{266-182\sqrt2}{3.4.5.6a^4}\right)z^6+\left(\frac{16436-11466\sqrt2}{3.4.5.6.7.8a^6}\right)z^8+\left(\frac{1606108-1127896\sqrt2}{3.4.5.6.7.8.9.10a^8}\right)$$
$$z^{10}+\&c.=\frac{(b-2a^{\sqrt2})a^{2-\sqrt2}}{2-\sqrt2} \quad . \; . \; . \; . \; . \; . \; . \quad (6)$$

Reverting (6),

$$z^2=\left(\frac{(b-2a^{\sqrt2})a^{2-\sqrt2}}{2-\sqrt2}\right)-\left(\frac{8-5\sqrt2}{3.4a^2}\right)\left(\frac{(b-2a^{\sqrt2})a^{2-\sqrt2}}{2-\sqrt2}\right)^2+\left(\frac{304-218\sqrt2}{3.4.5.6a^4}\right)\left(\frac{(b-2a^{\sqrt2})a^{2-\sqrt2}}{2-\sqrt2}\right)^3-\left(\frac{72548-51128\sqrt2}{3.3.4.5.6.7.8a^6}\right)\left(\frac{(b-2a^{\sqrt2})a^{2-\sqrt2}}{2-\sqrt2}\right)^4+\&c.$$

Restoring the numbers, we find

$z^2=2.27525+$, and $z=1.5083+$.

$\therefore$ $x=6.5083+$, and $y=3.4916+$.

2. Solve the equation $x^x=a$, and find the value of x when $a=300$.

Solution.

Taking the Naperian logarithm of each member of the proposed equation,

$$x\log.x=\log.a=b \quad . \; . \; . \; . \; . \; . \; . \quad (2).$$

Taking the Naperian logarithms of (2),

$$\log.x+\log.^2x=\log.^2a=\log.b=c \quad . \quad (3),$$

employing the notation $\log.^2x$ to denote the log. of log. x. Putting $(m-y)=\log.x$,

$$(m-y)+\log.(m-y)=c \quad . \; . \; . \; . \quad (4).$$

But $\log.(m-y)=\log.m-\frac{y}{m}-\frac{1}{2}\left(\frac{y}{m}\right)^2-\frac{1}{3}\left(\frac{y}{m}\right)^3-\frac{1}{4}\left(\frac{y}{m}\right)^4-$ &c.; therefore, by substitution, transposition, &c.,

$$y+\frac{y}{m}+\frac{1}{2}\left(\frac{y}{m}\right)^2+\frac{1}{3}\left(\frac{y}{m}\right)^3+\frac{1}{4}\left(\frac{y}{m}\right)^4+\frac{1}{5}\left(\frac{y}{m}\right)^5+\text{\&c.}=m+\log.m-c \quad . \quad . \quad . \quad . \quad (5).$$

Put $y=mz$, and (5) becomes

$$(m+1)z+\frac{1}{2}z^2+\frac{1}{3}z^3+\frac{1}{4}z^4+\frac{1}{5}z^5+\text{\&c.}=m+\log.m-c \quad . \quad . \quad . \quad (6).$$

Dividing by $n=m+1$,

$$z+\frac{z^2}{2n}+\frac{z^3}{3n}+\frac{z^4}{4n}+\frac{z^5}{5n}+\text{\&c.}=\frac{m+\log.m-c}{m+1}=q \quad (7).$$

Reverting (7)

$$z=q-\frac{1}{2n}q^2+\left(\frac{1}{2n^2}-\frac{1}{3n}\right)q^3-\left(\frac{5}{8n^3}-\frac{5}{6n^2}+\frac{1}{4n}\right)q^4+\left(\frac{7}{8n^4}-\frac{7}{4n^3}+\frac{13}{12n^2}-\frac{1}{5n}\right)q^5-\text{\&c.}$$

$$\therefore \log.x=m-mq+\frac{m}{2n}q^2-m\left(\frac{1}{2n^2}-\frac{1}{3n}\right)q^3+m\left(\frac{5}{8n^3}-\frac{5}{6n^2}+\frac{1}{4n}\right)q^4-m\left(\frac{7}{8n^4}-\frac{7}{4n^3}+\frac{13}{12n^2}-\frac{1}{5n}\right)q^5+\text{\&c., and } x=\frac{\log.a}{\log.x}.$$

When $a=300$, take $m=2$, and we have

$$q=\frac{2+\log.2-\log.^2 300}{3}=0.31734+\text{\&c., and}$$

$$z=q-\frac{1}{6}q^2-\frac{1}{18}q^3-\frac{1}{72}q^4-\frac{1}{3240}q^5-\text{\&c.}=0.29864+.$$

$$\therefore \log.x=1.40272, \text{ and } x=4.0662+.$$

Simple Method of Describing a Circle.

TAKE a slip of card or stout paper, stick a pin through one end for a pivot; at a distance from the pivot point equal to one-half the diameter of the required circle, make a small hole to insert the pencil point. By revolving the card on its pivot with the inserted pencil, a circle as perfect as if made with dividers is produced.

* * *

SUM TOTAL, it is asserted, is not tautological, but perfectly correct English, being a translation of the phrase *summa totalis*, taken from the old treatises on arithmetic, written in Latin. In these books *summa* was used to denote a number, and *summa totalis* to express the result of the addition of several numbers.

Discoveries in the Diophantine Analysis.

By DAVID ENGEL, New Windsor, Carroll Co., Maryland.

THE discoveries in analysis, made some thirty years ago, by William Lenhart, a citizen of the United States, have not been properly appreciated.

To the shame of men of science, the manuscripts of Mr. Lenhart remain unpublished.

They ask, What practical good is to be derived from such abstract speculations? To this I would answer, What good has resulted to mankind from the discovery of the simple theorem of Sir Isaac Newton, known as the "Binomial Theorem"? Among the many discoveries of that great man, why was the discovery of this simple theorem considered worthy of being selected to be engraved on his monumental tombstone?

The true lover of science needs no answer to the question. and to others any amount of explanation would scarcely serve to make it apparent.

And thus it is in regard to the discoveries of Mr. Lenhart, the importance of which consists in the generalizing of a great principle applicable to all cases. It is the discovery of a new rule by which to obtain desired results by short methods. As a single example of the practical utility of these rules, it is found, for instance, that the number 4 is composed of three cubes, whose roots are greater than unity. Thus has the question been answered which has so long puzzled the mathematicians of both Europe and America, viz: "To divide unity into three such positive parts, that if each part be increased by unity, the sums shall be three rational cubes?"

If the solution of a problem which before was considered impossible does not afford the most triumphant vindication of the practical advantage of these rules, it is difficult to conceive of any thing that could do so. And if the division of unity into three such parts as above stated has beaten the mathematicians of two continents, what would be the effect of dividing unity into twelve such parts, which (by means of these rules) can be done with about as much ease and facility in one case as in the other?

* * *

MAP is merely an abbreviation of *mappa*, the title given by the Romans to their *ludi circenses*, and other public games, the signal to commence which was given by Nero dropping his *mappa*, or handkerchief. As charts were then printed on linen, the *mappa* also gave its name to our familiar word "map."

THE "TRUE REMAINDER."

By Artemas Martin.

Let it be required to divide D by d, d being a composite number.

Put $d=d_1d_2d_3d_4 \ldots d_n$; $q_1,q_2,q_3,q_4, \ldots q_n=$ the several quotients respectively; $r_1,r_2,r_3,r_4 \ldots r_n=$ the respective remainders left by the divisors $d_1,d_2,d_3,d_4, \ldots d_n$; and $R_1,R_2,R_3,R_4, \ldots R_n=$ the *true* remainders after each division.

The operation will stand thus:

$$\begin{array}{l}
d_1\,)\underline{D} \\
d_2\,)\underline{q_1\,.}\,.\,.\; r_1,\text{ first remainder;} \\
d_3\,)\underline{q_2\,.}\,.\,.\; r_2,\text{ second remainder;} \\
d_4\,)\underline{q_3\,.}\,.\,.\; r_3,\text{ third remainder;} \\
\qquad q_4 \ldots r_4,\text{ fourth remainder;} \\
\qquad \vdots \quad \vdots \quad \vdots \quad \vdots \\
d_n\,)\underline{q_{n-1}} \\
\qquad q_n \ldots r_n,\text{ last remainder.}
\end{array}$$

Reversing the above operation, we have

$$d_1q_1+r_1=D,\text{ therefore } R_1=r_1;$$

$d_2q_2+r_2=q_1$, therefore $d_1q_1=d_1d_2q_2+d_1r_2$, and $d_1d_2q_2+d_1r_2+R_1=D$. But $D=d_1d_2q_2+R_2$, therefore $R_2=R_1+d_1r_2=r_1+d_1r_2$. Also, $d_3q_3+r_3=q_2$, therefore $d_1d_2q_2=d_1d_2d_3q_3+d_1d_2r_3$, and $d_1d_2d_3q_3+d_1d_2r_3+R_2=D$. But $D=d_1d_2d_3q_3+R_3$, therefore $R_3=R_2+d_1d_2r_3=r_1+d_1r_2+d_1d_2r_3$.

Similarly, we find

$$R_4=R_3+d_1d_2d_3r_4=r_1+d_1r_2+d_1d_2r_3+d_1d_2d_3r_4;$$

and, *generally*,

$$R_n=R_{n-1}+d_1d_2d_3 \ldots d_{n-1}r_n$$
$$=r_1+d_1r_2+d_1d_2r_3+d_1d_2d_3r_4+ \ldots +d_1d_2d_3 \ldots d_{n-1}r_n,$$

which is the "Rule" given in Arithmetics.

◆

MAGIC SQUARES.

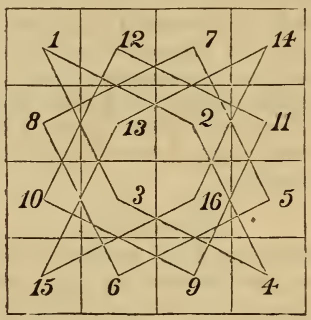
By Josiah Scott, Judge of the Ohio Supreme Court, Bucyrus, Ohio.

If the number of places or cells in each side of a magic square be represented by n, then such square must consist of n^2 consecutive natural numbers; and if the lowest number be 1, the highest number will be n^2, and the sum of the numbers in each vertical, horizontal, or diagonal row, will equal $\frac{n(n^2+1)}{2}$. If n be an *odd* number, this sum will be most conveniently expressed by the formula $n\frac{(n^2+1)}{2}$; and if n be an even number, then by the formula $\frac{n}{2}(n^2+1)$.

Where n is an *odd* number, a particular method of constructing such squares is, perhaps, generally known. But, we apprehend, it is not so generally known that such squares may also be constructed, if n be *any even number* greater than 2. Some of these magic squares are much more beautifully perfect than others. Many of them, for example, may be so constructed that if one or more rows or columns be transferred from any side of the square to the opposite side, the square will still retain its magic character; the sum of the numbers in every new diagonal thus formed, as well as of those in every row and column, being always $\frac{n(n^2+1)}{2}$. That is to say, in these *perfect* magic squares, the sum of each row, vertical or horizontal, and of each diagonal, actual or potential, $=\frac{n\,(n^2+1)}{2}$.

Thus, if $n=4$, a *perfect* magic square may be constructed in either of the following modes:

No. 1.



No. 2.

1	12	6	15
8	13	3	10
11	2	16	5
14	7	9	4

No. 3.

1	12	13	8
14	7	2	11
4	9	16	5
15	6	3	10

In these squares, the 1st and 3d rows, whether vertical or horizontal, may be made to change places with each other; and the same is true of the 2d and 4th rows; and, as we have said, any one or more rows may be transferred from any side of the square to the opposite one, and the squares will still be magical. In this manner, any one of the sixteen numbers may be made to occupy any given cell, so that each of these three different modes of construction admits of sixteen variations.

These squares have not only the properties of perfect magic squares, but in each of them the sum of the four corner numbers $=\frac{n}{2}(n^2+1)=34$; and the same is true of any four adjacent numbers forming a small square. And if we take away the outside rows from two adjacent sides, thus leaving a square of nine numbers, the sum of the corner numbers in any such square will also be found to be 34. The arrangement of the numbers in these squares also exhibits perfect order and symmetry. Thus, if we divide the 16 numbers into 4 series of 4 numbers in each; then we find, in squares Nos. 1 and 2, that the 1st and 4th series each has its numbers arranged in the form of a rhombus; whilst the 2d and 3d series each forms a square. The arrangement in No. 3 is different, but still methodical.

If n be a prime number, not less than 5, we may, in every such case, construct *a great variety of perfect* magic squares. The number of changes which may be made in a magic square of this kind, is expressed by the formula $n^2(n-1)^2 \times (n-3) \times (n-4)$. Hence, if $n=5$, we may have 800 different magic squares; if $n=7$, we have 21168 possible changes; and if $n=11$, the possible variations are 677600. All the possible varieties of these magic squares may be constructed by the following

General Rule.

1. Having ruled off a square containing n^2 cells, place the lowest of the given numbers in any cell you please, and go thence any number of cells, less than n, to the right or left, horizontally, and any other number of cells, less than n, up or down, vertically, and there place the second number.

Note.—The number of cells which you go vertically must not be *the same* as the number which you go horizontally, and the sum of the two must not be exactly *equal* to n.

2. Proceed from the cell last filled, the same number of cells horizontally, and in the same direction, as before, and the same number of cells vertically, and in the same direction, as before, and there write the third number; and so continue till you reach a cell already filled, when you will find that a series of n numbers have been written.

Note.—When you can not go the required number of cells in the required direction, you must go n minus that number in the opposite direction; or (which is the same thing), when you reach one end of a row, and are required to go further in the same direction, you pass to the opposite end of the same row, just as if the cells of every row (whether horizontal or vertical) were arranged *in a circle.*

3. Place the next consecutive number (which begins the second series of numbers) in any cell, not already filled, in which the second number of the first series might have been placed, pursuant to the first item of this rule; and note the position of this first number of the second series, with respect to the last number of the preceding series.

4. Proceed to write the remaining numbers of the second series consecutively, going each time the same number of cells horizontally, and the same number vertically, as when writing the numbers of the first series. When you reach a cell already filled, another series of n numbers will have been written.

5. The first number of the third and of every subsequent series must have the same position in respect to the last of the preceding series, which the first number of the second series has in respect to the last of the first series. And the same law which was adopted in locating the successive numbers of the first series, must govern in locating the successive numbers of every subsequent series.

To exemplify this rule, we annex a couple of squares in which $n=5$, and 1 is placed in the central cell; also two other squares in which $n=7$, and 1 is placed in the upper left hand corner of the squares.

12	5	18	6	24
16	9	22	15	3
25	13	1	19	7
4	17	10	23	11
8	21	14	2	20

10	21	12	3	19
2	18	9	25	11
24	15	1	17	8
16	7	23	14	5
13	4	20	6	22

1	39	28	10	48	30	19
49	31	20	2	40	22	11
41	23	12	43	32	21	3
33	15	4	42	24	13	44
25	14	45	34	16	5	36
17	6	37	26	8	46	35
9	47	29	18	7	38	27

1	40	23	13	45	35	18
10	49	32	15	5	37	27
19	2	41	24	14	46	29
28	11	43	33	16	6	38
30	20	3	42	25	8	47
39	22	12	44	34	17	7
48	31	21	4	36	26	9

We may also construct a *complex* magic square, whenever n is an even number greater than 4.

For example, if $n=10$, and $n^2=100$, we may construct a quadruple square, as follows :

1	6	8	11	92	94	96	97	98	2
91	19	80	79	78	77	25	26	20	10
12	28	33	66	65	64	41	34	73	89
13	29	38	43	54	49	56	63	72	88
87	71	61	50	55	44	53	40	30	14
86	70	62	52	45	58	47	39	31	15
16	32	42	57	48	51	46	59	69	85
17	74	67	35	36	37	60	68	27	84
83	81	21	22	23	24	76	75	82	18
99	95	93	90	9	7	5	4	3	100

In this square, the sum of each row $=\frac{n}{2}(n^2+1)=5(101)$. If from every side of this square we take away the outside row, we shall have a magic square left, consisting of all the numbers from 19 to 82 inclusive, and in which the sum of each row $=4\times101$. If we again take away the outside row from every side, we have a magic square left, containing all the numbers from 33 to 68 inclusive, and in which the sum of each row $=3\times101$. And if we once more take away the outside row, we still have a complete magic square left, containing all the numbers from 43 to 58 inclusive, and in which the sum of each row $=2\times101$. Similarly, we might construct a triple square from 64 consecutive numbers, a quintuple square from 144 numbers, &c.

The following may be termed a *compound* magic square, containing 144 numbers, and consisting of nine magic squares of 16 numbers each:

49	60	55	62	33	44	39	46	113	124	119	126
56	61	50	59	40	45	34	43	120	125	114	123
58	51	64	53	42	35	48	37	122	115	128	117
63	54	57	52	47	38	41	36	127	118	121	116
129	140	135	142	65	76	71	78	1	12	7	14
136	141	130	139	72	77	66	75	8	13	2	11
138	131	144	133	74	67	80	69	10	3	16	5
143	134	137	132	79	70	73	68	15	6	9	4
17	28	23	30	97	108	103	110	81	92	87	94
24	29	18	27	104	109	98	107	88	93	82	91
26	19	32	21	106	99	112	101	90	83	96	85
31	22	25	20	111	102	105	100	95	86	89	84

This square might as readily have been constructed of 16 magic squares, each containing 9 numbers; and in a similar manner we may construct *compound* magic squares whenever n is the product of any two integral factors, neither of which is less than 3.

THE MOON.

By Dr. Joel E. Hendricks, Des Moines, Iowa.

Although the moon is of infinitely less importance to the inhabitants of the earth than the sun, and its attractive influence upon the earth is only about one one-hundred-and-sixtieth part that of the sun, yet because of its *superior* influence in raising tides, both in the ocean and in the atmosphere, and of its *apparently* erratic course in the heavens, it excites more popular attention, perhaps, than the sun himself.

The determination of the actual motions of the moon and of its geocentric position for any required period of time, is one of the most difficult problems in physical astronomy, and its complete discussion in Bowdich's translation of the "Mecanique Celeste" occupies no less than 342 quarto pages. It is to be expected, therefore, that many of the most popular notions entertained in relation to the appearance, motions, and influence of the moon would be erroneous. But as analysis has only disclosed the cause and *demonstrated* the existence of some of the minor irregularities of the moon's motions *after* the irregularities had been practically observed and noted, so it is likely that some of the popular opinions relative to the moon's influence which science does not now recognize, may, at some future time, be shown to be necessary consequences of the atmospheric tides which the moon is known to be capable of raising.

Although, to the astronomer, there is no difficulty in understanding how the moon's influence in raising tides can be greater than that of the sun, while its attractive influence is much less, yet many intelligent persons, who have not studied the subject, regard such a proposition as simply absurd, and believe either that the moon is not the principal cause of the tides, or else that its attractive force upon the earth is greater than that of the sun. It is for the benefit of these that the following demonstration is offered.

Sir Isaac Newton first announced the proposition that all matter *attracted* all other matter with a force that is directly as the *quantity* and inversely as the square of the *distance*. This proposition, though empirical, has been confirmed by every test applied since Newton's time, and is, therefore, now generally accepted as a demonstrated fact.

If we accept this fact as sufficiently demonstrated, it is easy to show that any body, as the moon, for instance, moving in a circular or elliptic orbit around any other body, as the earth, whose attractive force at the moon's distance is φ, will have a centrifugal force, urging it directly *from* the earth, equal to $\varphi = \frac{mv^2}{r}$; in which m is the mass of the revolving body, v its velocity, and r its distance from the attracting body. In reality, however, the moon does not revolve around the earth as a center, but the earth and moon revolve about their common center of inertia, which is about 3000 miles from the earth's center, and consequently about 1000 miles below its surface.

If m^1 represent the earth's mass, r^1 the distance of its center from the center of inertia of the earth and moon, and v^1 the velocity about that center, we shall have for its centrifugal force $\frac{m^1 v^{1\,2}}{r^1}$. . . . . (a)

As the sun's mass is about 355,000 times that of the earth, and his distance about 400 times the distance of the moon, assuming the moon's mass to be about $\frac{1}{75}$ that of the earth, we shall have for the attraction of the sun upon the earth to that of the moon $\frac{\frac{1}{75}}{(1)^2} : \frac{355000}{(400)^2}$, which gives for the attractive influence of the sun *one hundred and sixty-six* times that of the moon.

The tides raised by the sun and moon upon the earth are not, however, an indication of the absolute force of attraction exerted by those bodies upon the earth, but of their *relative* force upon different *parts* of the earth, thereby causing a distortion of its figure.

The moon's attractive influence on the earth's nearest surface is greater than its influence on the earth's farthest surface by $\left(\frac{244000}{240000}\right)^2 - \left(\frac{236000}{240000}\right)^2 = \frac{1}{15}$ of its attractive influence, and the sun's attractive influence on the earth's nearest surface is greater than his attractive influence on the earth's farthest surface by $\left(\frac{95004000}{95000000}\right)^2 - \left(\frac{94996000}{95000000}\right)^2 = \frac{1}{6000}$ (nearly) of the sun's attractive force; or, (multiplying $\frac{1}{6000}$ by 166) $= \frac{1}{36}$ of the sun's attractive force. That is, the sun's power to distort the figure of the earth is to that of the moon as 15 : 36, or as 2 : 5 nearly.

From (a) we perceive that, as a consequence of the moon's attraction, the earth is continually falling toward the moon from a tangent to its orbit around their common center of inertia, and as it has been shown that this attraction is greater than at the earth's surface farthest from the moon by $\frac{1}{2}$ of $\frac{1}{15}\left(=\frac{1}{30}\right)$ of the moon's attraction, the earth will, therefore, fall away from the water and the atmosphere on the *opposite* side of the earth from the moon; that is, the water and the atmosphere, being acted on by a less force than the mean force which acts on the solid mass, will lag behind in their motions, and will, therefore, be heaped up on the side of the earth *opposite* the moon, as well as under the moon.

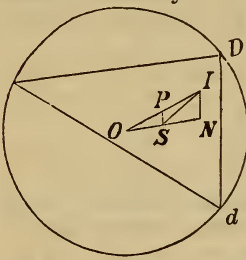
The moon, therefore, (and the sun also, to a less extent,) will produce *two* tides simultaneously, both in the ocean and the atmosphere, at opposite points of the earth's surface.

* * *

GEOMETRIC NOTES.

By **Isaac H. Turrell**, Cumminsville, Ohio.

The method of the following deductions is due to Dr. George Salmon, of Dublin, and affords an easy proof of several remarkable theorems in Geometry.



1. Let D, d, represent the distances between the point of intersection (I) of the perpendiculars of a triangle, and the centers of the circumscribed and inscribed circles (O, S). It is easily shown that $D^2 = R^2 - 8R^2 \cos A \cos B \cos C$, $d^2 = 2r^2 - 4R^2 \cos A \cos B \cos C$.

$$\therefore D^2 - 2d^2 = R^2 - 4r^2$$

Produce OS to N, making SN=OS, and since, by a well known principle, $OS^2 = R^2 - 2Rr$, it easily follows that $IN = R - 2r$. Hence, if the two circles be fixed, the locus of the intersection of perpendiculars is a circle whose center is N, and radius $R - 2r$.

2. Since the nine-point circle passes through the middle points of the sides of the triangle, it circumscribes a similar triangle whose sides are the halves of the others; its radius is, therefore, $\frac{1}{2}R$, and it is not difficult to show that its center (P) is the middle point of OI. Hence SP is parallel to IN, and is equal to $\frac{1}{2}R - r$, $\therefore$ the locus of the center of the nine-point circle is a circle, having for its center the center of the inscribed circle. Again, the distance between the centers of the inscribed and nine-point circles has been proved to be exactly the difference between their radii; and similar reasoning applies to any of the three escribed circles. Hence the nine-point circle touches the four circles of contact.

3. It is easily proved that the center of gravity of the triangle also lies on the line OI, and is a fourth harmonic to the points O, I, P.

* * *

SOLUTION OF A DIOPHANTINE PROBLEM.

By **Dr. David S. Hart**, Stonington, Conn.

To make $ax^2 + bx + c = \square$.

I. When the expression can be divided into two binomial factors, which can always be done when $b^2 - 4ac = \square$. Let the quantity so divided be put = a square whose root is $\frac{m}{n} \times$ either factor, then by reduction we shall find the value of x in terms of m and n.

II. When a simple value of x can be found which will make the expression a square. This method is the best when x is a small number, either positive or negative. Other values of x may be found by putting $x = y \pm$ the number already found and substituting in the given expression.

III. When $b^2 - 4ac$ is not a square, then the method of congruent numbers, discovered by Gauss, the celebrated Swiss mathematician, may be employed; but to find x by this method is very difficult, and beyond the reach of common mathematicians. The following method is much easier.

Subtract such a monomial or binomial square from the given expression that the remainder may be separated into two binomial factors, which can always be done when the problem is possible, or when $b_1{}^2 - 4a_1c_1 = \square$; then put the expression thus arranged equal to a square whose root is made up of the root of the square subtracted $\pm \frac{m}{n} \times$ either of the factors, and by reduction a fractional value of x will be found which can be rendered integral by putting the denominator = 1. From this equation the value of m may be obtained by quadratics, which value will be composed of a rational number and a surd. The surd may be made rational by finding some simple value of n making it a square, whence m is found, and thence x is known.

But when x is negative, let $x = y -$ the value of x already found; then, substituting in the original expression, and making the result a square by the usual method, we shall have a fractional value of x, the denominator of which will be of the form of p^2-Nq^2, and by putting the denominator $=1$, an integral value will be had. By extracting the square root of N in a continued fraction, we shall have a series of quotients forming a period, the last quotient being twice the root of the greatest square in N. From these quotients a series of converging fractions can be formed, the last of which, standing under the last quotient, will give the values of p and q, p being the numerator and q the denominator; whence y is known, and thence x is found.

Example.

Find x, such that $94x^2+57x+34=\square$.

Solution.

From the given expression subtract the square $(3x-4)^2$, and the remainder will be $85x^2+81x+18$. Since $b_1{}^2-4a_1c_1=\square$, divide this into the factors $(5x+3)(17x+6)$ and put

$$(3x-4)^2+(5x+3)(17x+6)=\left\{(3x-4)-\frac{m}{n}(5x+3)\right\}^2;$$

then, reducing, we find

$$x=\frac{3m^2+8mn-6n^2}{17n^2+6mn-5m^2}.$$

In order to have x integral, put

$$17n^2+6mn-5n^2=1;$$

whence, by transposing and dividing,

$$m^2-\frac{6}{5}mn=\frac{17n^2-1}{5},$$

and by quadratics

$$m=\frac{3n}{5}\pm\frac{\sqrt{94n^2-5}}{5},$$

where $94n^2-5$ must be a square, which is the case where $n=3$; $\therefore m=-4$, and $x=-102$; Here, to have a positive value of x, put $x=y-102$. then by substitution the original expression becomes $94y^2-19119y+972196=\square=\left(986-\frac{p}{q}y\right)^2$. Reducing, we find

$$y=\frac{(1972p-19119q)q}{p^2-94q^2}.$$

To find $p^2-94q^2=1$, develop $\sqrt{94}$ into a continued fraction, and the quotients will be 9; 1,2,3, 1,1,5,1.8,1,5,1,1,3,2,1,18, constituting one period; then form a series of converging fractions, and that fraction standing under 18 in an even place is $\frac{2143295}{221064}$. Calling the numerator p, and the denominator q, we shall have $y=12185931936$, whence $x=12185931834$. Innumerable other values of x may be found by means of the successive periods of quotients.

The value of x obtained by method I is fractional, but integral values may be found, as in the last method, by putting the denominator$=1$.

It may be observed that a period does not reckon the greatest square root in N as one of its quotients, a semicolon being placed after it as a mark of separation.

On a General Formula for the Summation of Series.

By **David Trowbridge, A. M.**, Waterburg, Tompkins Co., N. Y.

1. Let s be the sum of x terms of a series, of such a nature that $s=\varphi x=$function of x. Let u be the x^{th} term, then u will be the difference between two series of the same kind, one of them consisting of x terms, and the other of $x-1$ terms. This will give us the following equation:

$$(1)\quad u=\varphi x-\varphi(x-1)=\mathrm{D}_x\varphi x-\frac{\mathrm{D}_x^2\varphi x}{1.2}+\frac{\mathrm{D}_x^3\varphi x}{1.2.3}-\&c.$$

Or by putting s for φx,

$$(2)\quad u=\mathrm{D}_xs-\frac{\mathrm{D}_x^2 s}{1.2}+\frac{\mathrm{D}_x^3 s}{1.2.3}-\frac{\mathrm{D}_x^4 s}{1.2.3.4}+\&c.$$

The third member of (1) is obtained by developing the second one by means of "Taylor's Theorem."

Multiply (2) by dx, transpose and integrate and we obtain

$$(3)\quad s=\int udx+\frac{\mathrm{D}_xs}{1.2}-\frac{\mathrm{D}_x^2 s}{1.2.3}+\frac{\mathrm{D}_x^3 s}{1.2.3.4}-\&c.+C.$$

If we take the successive differential co-efficients of (2) with respect to x, we shall have

$$(4)\quad \mathrm{D}_xu=\mathrm{D}_x^2 s-\frac{\mathrm{D}_x^3 s}{1.2}+\&c.,\quad \mathrm{D}_x^2 u=\mathrm{D}_x^3 s-\frac{\mathrm{D}_x^4 s}{1.2}+$$

$$\&c.,\quad \mathrm{D}_x^3 u=\mathrm{D}_x^4 s-\frac{\mathrm{D}_x^5 s}{1.2}+\&c.,\ \&c.$$

From equations (2) and (4) we see that it is possible to eliminate D_xs, $\mathrm{D}_x^2 s$, &c., from (3) and obtain a new series in terms u, D_xu, $\mathrm{D}_x^2 u$, &c., and *numerical* co-efficients. Thus, one-half of (2) changed to the form $0=u-\mathrm{D}_xs+\frac{\mathrm{D}_x^2 s}{1.2}-\&c.$ and added to (3) will eliminate D_xs, and give

$$(5)\quad s=\int udx+\tfrac{1}{2}u+\frac{1}{12}\mathrm{D}_x^2 s-\&c.+C.$$

Let us now suppose the elimination performed. and that we have (putting $A_0=\frac{1}{2}$ . . . . [a])

(6) $s=\int u dx=A_0u+A_1D_xu+A_2D_x^2u+A_3D_x^3u+\&c$ $+C$,

in which A_1, A_2, A_3, &c., are undetermined numerical coefficients.

By taking the successive differential coefficients of (6) with respect to x, and substituting their values in (2), we shall obtain the means, by the theory of indeterminate coefficients, for determining A_1, A_2, A_3, &c., A_0 having already been found.

We have $D_xs=u+A_0D_xu+A_1D_x^2u+A_2D_x^3u+\&c.$,

$$D_x^2s=\quad D_xu+A_0D_x^2u+A_1D_x^3u+\&c.,$$

$$D_x^3s=\qquad D_x^2u+A_0D_x^3u+\&c.,$$

$$D_x^4s=\qquad\qquad D_x^3u+\&c.$$

Substituting these values in (2) we have

$$u=u+\left(A_0-\frac{1}{1.2}\right)D_xu+\left(A_1-\frac{A_0}{1.2}+\frac{1}{1.2.3}\right)D_x^2u+\left(A_2-\frac{A_1}{1.2}+\frac{A_0}{1.2.3}-\frac{1}{1.2.3.4}\right)D_x^3u+\&c.,$$

the general term being

$$\left(A_n-\frac{A_{n-1}}{1.2}+\frac{A_{n-2}}{1.2.3}-\frac{A_{n-3}}{1.2.3.4}+\frac{A_{n-4}}{1.2.3.4.5}-\ldots+(-1)^n\frac{A_0}{1.2.3\ldots(n+1)}+(-1)^{n+1}\frac{1}{1.2.3\ldots(n+2)}\right)D_x^{n+1}u$$

This equation must now give

$$A_0-\tfrac{1}{2}=0,\ A_1-\frac{A_0}{1.2}+\frac{1}{1.2.3}=0,\ A_2-\frac{A_1}{1.2}+\frac{A_0}{1.2.3}-\frac{1}{1.2.3.4}=0,\ \ldots\ldots\ \&c.$$

(7) $$A_n-\frac{A_{n-1}}{1.2}+\frac{A_{n-2}}{1.2.3}-\frac{A_{n-3}}{1.2.3.4}+\frac{A_{n-4}}{1.2.3.4.5}-\ldots\ldots+(-1)^n\frac{A_0}{1.2.3\ldots(n+1)}+(-1)^{n+1}\frac{1}{1.2.3\ldots(n+2)}=0.$$

By making n successively 0, 1, 2, 3, &c., (7) will make known the values of all the quantities, A_0, A_1, A_2, &c.. We readily find $A_0=\frac{1}{2}$, $A_1=\frac{1}{12}$, $A_2=0$, $A_3=-\frac{1}{720}$, $A_4=0$, &c.

But this process is tedious, and so we shall seek some shorter method for determining these coefficients.

Let us find by means of (6) the sum of the following series:

(8) $s=\sin\theta+\sin2\theta+\sin3\theta+\sin4\theta+\ldots+\sin x\theta$.

Here we have $u=\sin x\theta$, $\int u dx=-\frac{1}{\theta}\cos x\theta$,

$D_xu=\theta\cos x\theta$, $D_x^2u=-\theta^2\sin x\theta$, $D_x^3u=-\theta^3\cos x\theta$, $D_x^4u=\theta^4\sin x\theta$, &c.

Substituting these values in (6) we find

$$s=\cos x\theta\left[-\frac{1}{\theta}+A_1\theta-A_3\theta^3+A_5\theta^5-\&c.\right]+\sin x\theta\left[A_0-A_2\theta^2+A_4\theta^4-A_6\theta^6+\&c.\right]$$

Now put B equal to the coefficient of $\sin x\theta$, and B′ equal to that of $\cos x\theta$, so that

(9) $B=A_0-A_2\theta^2+A_4\theta^4-A_6\theta^6+\&c.$,

(10) $B'=-\frac{1}{\theta}+A_1\theta-A_3\theta^3+A_5\theta^5-\&c.$

We now have

(11) $s=B\sin x\theta+B'\cos x\theta+C$.

When $x=0$, $s=0$, and hence $C=-B'$, and we have (12) $s=B\sin x\theta-B'(1-\cos x\theta)$.

B and B′ will remain the same whatever integral value x may have. If, therefore, in the first place, we suppose $x=1$, we see by (8) that $s=\sin\theta$; and if $x=2$, $s=\sin\theta+\sin2\theta$. These values in (12) will give us the following equations for determining B and B′:

(13) $\sin\theta=B\sin\theta-B'(1-\cos\theta)$,

(14) $\sin\theta+\sin2\theta=B\sin2\theta-B'(1-\cos2\theta)$.

From (13), $2(B-1)\sin\frac{1}{2}\theta\cos\frac{1}{2}\theta=2B'\sin^2\frac{1}{2}\theta$,

$B'=(B-1)\cot\frac{1}{2}\theta$. . . . . (15).

From (14) $\sin\theta+2\sin\theta\cos\theta=2B\sin\theta\cos\theta-2B'\sin^2\theta$; $1+2\cos\theta=2B\cos\theta-2B'\sin\theta$. Hence $1=2(B-1)\cos\theta-2B'\sin\theta=$ (from [15]) $2(B-1)\cos\theta-2(B-1)\sin\theta\cot\frac{1}{2}\theta=2(B-1)[\cos\theta-\sin\theta\cot\frac{1}{2}\theta]=-2(B-1)$, $\therefore B=\frac{1}{2}$ and by (15) $B'=-\frac{1}{2}\cot\frac{1}{2}\theta$.

These values of B and B′ in (9) and (10) give, since $A_0=\frac{1}{2}$,

(16) $\frac{1}{2}=\frac{1}{2}-A_2\theta^2+A_4\theta^4-A_6\theta^6+\&c.$, or

$-A_2\theta^2+A_4\theta^4-A_6\theta^6+\&c.=0$,

(17) $\frac{1}{2}\cot\frac{1}{2}\theta=\frac{1}{\theta}-A_1\theta+A_3\theta^3-A_5\theta^5+\&c.$

These are true for all values of θ. Hence, in (16) divide by θ^2 and make $\theta=0$, and we find $A_2=0$; and in the same way we shall find A_4, A_6, . . . A_{2m} all equal to 0.

Since (17) is the development of $\frac{1}{2}\cot\frac{1}{2}\theta$, we at once find, by comparing the series (17) with the known development of this function,

$$A_1=\frac{1}{2^2.3},\ A_3=-\frac{1}{2^4.3^2.5},\ A_5=\frac{1}{2^5.3^3.5.7},$$

$$A_7=-\frac{1}{2^8.3^3.5^2.7},\ A_9=\frac{1}{2^9.3^3.5.7.9.11},\ \&c.$$

We now have

(18) $$s=\int u dx+\frac{u}{2}+\frac{D_xu}{2^2.3}-\frac{D_x^3u}{2^4.3^2.5}+\frac{D_x^5u}{2^5.3^3.5.7}\ \frac{D_x^7u}{2^8.3^3.5^2.7}+\frac{D_x^9u}{2^9.3^3.5.7.9.11}-\&c.+C.$$

From what precedes we readily find

$$\sin\theta+\sin2\theta+\sin3\theta+\ldots\ldots+\sin x\theta=\tfrac{1}{2}\sin x\theta+\tfrac{1}{2}\cot\tfrac{1}{2}\theta(1-\cos x\theta)=\frac{\sin\frac{1}{2}(x+1)\theta\sin\frac{1}{2}x}{\sin\frac{1}{2}}.$$

2. *Examples.*

Let $s = ar + ar^2 + ar^3 + \dots + ar^x$. Here $u = ar^x$, $\int u dx = \frac{ar^x}{\log.r}$, $D_x u = ar^x \log.r$, $D_x^3 u = ar^x (\log.r)^3$, $D_x^5 u = ar^x (\log.r)^5$, &c.

These values in (18) give

$$s = ar^x \left[\frac{1}{\log.r} + \tfrac{1}{2} + \frac{\log.r}{2^2.3} - \frac{(\log.r)^3}{2^4.3^2.5} + \&c. \right] + C.$$

Call the coefficient of ar^x, which is constant, A, and we have $s = Aar^x + C$.

If $x=0$, $s=0$, $\therefore 0 = Aa + C$; if $x=1$, $s = ar = Aar + C = Aa(r-1)$; $\therefore A = \frac{ar}{a(r-1)} = \frac{r}{r-1}$, and $s = \frac{ar^{x+1}}{r-1} - \frac{ar}{r-1} = \frac{ar(r^x-1)}{r-1}$, the usual formula. We see also that

$$(19)\quad \frac{r\log.r}{r-1} = 1 + \frac{\log.r}{2} + \frac{(\log.r)^2}{2^2.3} - \frac{(\log.r)^4}{2^4.3^2.5} + \&c.$$

This equation gives us r in terms of $\log.r$.

Let $s = 1^n + 2^n + 3^n + \dots + x^n$.

Here $u = x^n$, $\int u dx = \frac{x^{n+1}}{n+1}$, $D_x u = nx^{n-1}$, $D_x^2 u = n(n-1)x^{n-2}$, $\dots$ $D_x^\rho u = n(n-1)(n-2) \dots (n-\rho+1)x^{n-\rho}$.

Hence

$$s = \frac{x^{n+1}}{n+1} + \tfrac{1}{2}x^n + \frac{nx^{n-1}}{12} - \frac{n(n-1)(n-2)x^{n-3}}{720} + \frac{n(n-1)(n-2)(n-3)(n-4)x^{n-5}}{10080} - \&c. + C.$$

If $n=1$, $s = \frac{x^2}{2} + \frac{x}{2} + \frac{1}{12} + C$. If $x=0$, $s=0$, $C = -\frac{1}{12}$, $s = \frac{x(x+1)}{2}$

In (19) restore the coefficients A_0, A_1, A_3, A_5, &c., and put $r = e^t$, $\log.r = t$, and we find

$$\frac{te^t}{e^t-1} = 1 + A_0 t + A_1 t^2 - A_3 t^4 + A_5 t^6 - \&c. = \frac{t}{1-e^{-t}} = \frac{t}{t - \frac{t^2}{2} + \frac{t^3}{2.3} - \&c.} = \frac{1}{1 - \frac{t}{2} + \frac{t^2}{2.3} - \frac{t^3}{2.3.4}}.$$

This equation would make known the coefficients A_0, A_1, A_3, &c.; and it shows that the cotangent series is connected with the exponential series. We see, also, that formula (7) will make known the coefficients in the development of the cotangent series.

It would seem that this series, with this demonstration, might be advantageously introduced into our elementary works on the Calculus.

This series was first given by Euler, but his demonstration being unsatisfactory, the formula was neglected for many years.

In his *Calculus*, pp. 265-6, DeMorgan has given a demonstration, the coefficients A_0, A_1, &c., being found from the development of $\frac{t}{e^t-1}$ and the Numbers of Bernoulli. In Gould's *Astronomical Journal*, No. 40, May 22, 1852, L. W. Meech, A.M., has given another demonstration founded on geometrical considerations, and the reader will there find numerous examples showing the applications of the formula. He has also indicated another demonstration, where the coefficients $D_x s$, $D_x^2 s$, &c., are eliminated by the ordinary process which we have indicated from equations (4) to (5). He has also reproduced his first demonstration in his treatise "On the Relative Intensity of the Heat and Light of the Sun upon Different Latitudes of the Earth," published in the *Smithsonian Contributions to Knowledge*, 1856.

We have nowhere seen the connection of this summation formula with the cotangent series pointed out. Several years ago we obtained this demonstration, which, as the reader will see, connects the formula with the elementary series given in works on the Calculus.

We sent a paper on this and some other series to the Burlington Meeting of the American Association for the Advancement of Science, 1867, which was *read*, but not published in the volume of memoirs.

3. *Problems.*—Find by the preceding method the sums of the following series:

1. $1^2+2^2+3^2+ \dots +x^2$, $1^3+2^3+3^3+ \dots +x^3$, &c.
2. $\log1+\log2+\log3+ \dots +\log x$, and thence an expression for the product $1.2.3.4. \dots x$.
3. $1 + \frac{1}{1+r} + \frac{1}{1+2r} + \frac{1}{1+3r} + \dots + \frac{1}{1+xr}$ and thence $1+\tfrac{1}{2}+\tfrac{1}{3}+\tfrac{1}{4}+ \dots + \frac{1}{x}$.
4. $\sin\theta - \sin2\theta + \sin3\theta - \dots + (-1)^{x+1}\sin x\theta$:
5. $\cos\theta + \cos2\theta + \cos3\theta + \dots + \cos x\theta$.

A FARMER was dividing his property among his four sons. In return one was to board him, another to lodge him, a third to clothe him, and the fourth, at his death, was to bear the funeral expenses. After some little consideration, each seemed satisfied with his lot, except the fourth, who kept silent. "Are you not content?" asked the lawyer. "I don't know," replied the hopeful; "I was thinking how much it would cost to plant the old man."

PROBLEMS FOR SOLUTION.

1. Proposed by **David Engel**, New Windsor, Carroll Co., Maryland.

It has been estimated that the average number of ova deposited annually at the spawning season by a pair of herring is 2000. Supposing that every egg produces a fish, and that there are as many males as females, what would be the number of herring, as the offspring of a single pair in 12 years?

2. Proposed by **Isaac H. Turrell**, Cumminsville, Hamilton Co., Ohio.

Having given the perpendicular, and the radii of the inscribed and circumscribed circles; to find the sides of the triangle by a geometrical construction, demonstration, and calculation.

3. Proposed by **H. R. Spink**, Mason City, Cerro Gordo Co., Iowa.

A man starts from a place at the rate of 2 miles an hour, but *continually* increases his speed by a geometrical ratio. At the end of one hour he is going at the rate of 6 miles an hour. It is required to find how far he goes in that time.

4. Proposed by **Dr. S. P. Bartlett**, East Dixfield, Oxford Co., Maine.

Three circles, whose diameters are 132, 154, and 176 feet, touch each other externally. Required—the diameter of the circle circumscribing the given circles, (1) by a geometrical construction, demonstration, and calculation; (2) by an algebraical or analytical solution.

5. Proposed by **Rev. U. Jesse Knisely**, Newcomerstown, Tuscarawas Co., Ohio.

The inside dimensions of an open box are 4 feet in length, 1 foot in depth, and 1 foot in width. It is $\frac{3}{4}$ full of water. A squared stick, 6 inches square, is slid in upon its side as far as possible, parallel to two sides of the box. What length of the stick will be wet?

6. Proposed by **David Engel**, New Windsor, Carroll Co., Maryland.

A quadrilateral is divided into two parts by a line joining two opposite sides. Prove that the intersections of the diagonals of the whole figure and of the parts are in the same straight line.

7. From the **Saturday Evening Post**.

A owns a tract of land containing 1000 acres, in the shape of a rectangular parallelogram, the shortest side fronting to a public highway; the land depreciates in value as you go from the front towards the rear. B wishes to purchase. A sets his price in the following manner: he would sell him 10 acres off the front for $100, (by a line running parallel to the road, and taking all the front,) or he would sell 100 acres for $200, or the whole tract for $300. B concludes to take 65 acres. What shall be the price thereof?

J. Semnis, Babylon.

8. Proposed by **Evans Giles**, Enterprise Landing, South Carolina.

It is required to find the time occupied by the sun in *rising*, to an observer whose eyes are 5 feet 6 inches above the earth's surface, supposing both bodies to be spheres, the diameter of the earth 7912 miles, the diameter of the sun 887076 miles, and the distance between their centers 95000000 miles.

9. Proposed by **E. P. Norton**, Allen, Hillsdale Co., Michigan.

Determine the radii of three circles inscribed in a triangle whose sides are 168(a), 150(b), 102(c), each circle touching the other two and also two sides of the triangle; (1) by a geometrical construction, demonstration, and calculation; (2) by an algebraical or analytical solution.

10. Proposed by **W. H. Johnson**, Newtown, Bucks Co., Pennsylvania.

The diameters of the ends of a frustum of a cone are 6 and 4 feet. When lying on its slant side on a horizontal plane, the slightest touch will cause it to topple over on its smaller end. Required—the length of the frustum.

11. Proposed by **William Griffith**, Superintendent of the Public Schools of Fairfield, Fairfield, Huron Co., Ohio.

A copper globe floating in a vessel of mercury was raised 2 inches by pouring in water enough to cover it. Required—the diameter of the globe.

12. Proposed by **James Clark**, Wayne, Kennebec Co., Maine.

There is a series of right-angled triangles whose legs differ by unity only. Calling the one whose sides are 3, 4, 5 the *first* triangle, it is required to find general expressions for the sides of the n^{th} triangle, and compute the sides when $n=80$.

13. Proposed by **Benjamin Headley**, Farmer's Retreat, Dearborn Co., Indiana.

How many spheres, one inch in diameter, can at the same time touch a central sphere one foot in diameter?

14. Proposed by **James M. Greenwood**, Kirksville, Adair Co., Missouri.

The centers of two spheres are at the extremities of a given straight line, on which a circle is described; find a point in the circumference of the circle from which the greatest portion of spherical surface is visible.

15. Proposed by G. B. Vose, Professor of Mechanics and Civil Engineering, Washington and Jefferson College, Washington, Washington Co., Pa.

If three circles whose radii are a, b, c, touch each other externally, three other circles may be drawn within the space enclosed by the first three circles, tangent to each other and to the given circles.

Calling the radii of the new circles x_1, y_1, z_1, we may determine three other circles, radii x_2, y_2, z_2, touching each other and the second set in a similar way; and so on.

Find the radii, x_n, y_n, z_n, of the n^{th} set of inscribed circles.

16. Proposed by Dr. David S. Hart, Stonington, New London Co., Conn.

Find three numbers such that if the sum of their cubes be added to the cube of their sum, the sum shall be a square number.

17. From Cambridge Examination Papers.

The radii of the fore and hind wheels of a coach are r and R, and the distance between their centers is a. A particle driven from the highest point of the hind wheel falls on the highest point of the fore wheel. Find the velocity of the coach.

18. Proposed by Artemas Martin, McKean, Erie Co., Pennsylvania.

A cask containing a gallons of wine stands on another containing b gallons of water; they are connected by a pipe, through which, when open, the wine can run into the lower cask at the rate of c gallons per minute, and through a pipe of the same size in the bottom of the lower cask the mixture can escape; also, water can be let in through a pipe in the top of the upper cask at the same rate. If all the pipes be opened at the same instant, how much *wine* will be in the lower cask at the end of t minutes, supposing the fluids to mingle thoroughly?

19. Proposed by Asher B. Evans, A.M., Lockport, Niagara Co., New York.

Prove that the sum of the series of numbers obtained by giving x every integral value from $x=1$ to $x=n$ in the formula

$$x(x+1)(x+2)\ldots\ldots(x+y)$$

is $$\left(\frac{n+y+1}{y+2}\right)\left\{n(n+1)(n+2)\ldots\ldots(n+y)\right\}.$$

20. Proposed by Dr. James Matteson, De Kalb Center, De Kalb Co., Illinois.

The compressibility of water (that is, the diminution of bulk it sustains by an additional pressure equal to one atmosphere,) is 0.000049589. A cubic foot of sea water weighs 1028 ounces at the surface of the ocean when the temperature is 32 degrees Fahrenheit, and the barometer stands at 30 inches. Required—the weight of a cubic foot of water at the depth of 6 miles, the temperature there being 70 degrees.

21. Proposed by David Trowbridge, A.M., Waterburg, Tompkins Co., New York.

Required a complete solution of Prof. Kirkwood's problem, *Mathematical Monthly*, Vol. II, p. 329:

"A given cylindrical vessel, filled with water, is placed with its base upon a horizontal plane. It is required to determine the angle of inclination to which the plane must be raised before the vessel will fall, the water being at liberty to overflow its top. The base is supposed to be fixed so as to prevent it from sliding, but not from tilting when the plane is inclined.

22. Proposed by Abijah McLean, New Lisbon, Columbiana Co., Ohio.

It is required to find two numbers, other than 2 and 3, the sum of whose cubes shall be 35.

23. Proposed by David Wickersham, Wilmington, Clinton Co., Ohio.

Required the equation to the curve which cuts at an angle of 45 degrees the circumferences of all the ellipses having a common major axis.

24. Proposed by Dr. David S. Hart, Stonington, New London Co., Conn.

To find n numbers whose sum is a square, such that if to the square of each the remaining numbers be added, the sums shall be squares.

25. Proposed by David Trowbridge, A.M., Waterburg, Tompkins Co., New York.

A rectangular hole is made through the center of an ellipsoid whose axes are a, b, c, parallel to any of the axes. Required—the volume of the part removed.

26. Proposed by Asher B. Evans, A.M., Lockport, Niagara Co., New York.

The point D is taken at random in the side AB of the triangle ABC, E in BC and F in CA; the point P is taken at random in the triangle ADF, Q in BDE and R in CEF. The average area of the triangle PQR is required.

27. Proposed by R. M. De France, Mercer, Mercer Co., Pa.

An auger hole 10 inches in diameter, is made through a solid cylinder 20 inches in diameter, the axis of the auger intersecting the axis of the cylinder at right angles. Required—(1) the square inches of the surface, (2) the cubic inches of the volume of the cylinder removed.

28. Proposed by S. G. Cagwin, New London, Oneida Co., New York.

Suppose a fly lights on the spoke of a carriage wheel 5 feet in diameter, 6 inches up from the ground. What distance will the fly move while the wheel makes one revolution on a level plane?

29. Proposed by David Engel, New Windsor, Carroll Co., Md.

It is required to divide unity into three such positive parts, that if unity be added to each part the three sums shall be three rational cubes.

30. Proposed by Artemas Martin, McKean, Erie Co., Pennsylvania.

Find the average area of all the triangles that can be formed by joining three points taken at random on the surface of a given triangle.

31. Proposed by G. B. Vose, Professor of Mechanics and Civil Engineering, Washington and Jefferson College, Washington, Washington Co., Pa.

Three equal circles are placed at random on a circle three times as large. What is the probability that the portion of the surface of the larger circle *not* covered by the equal circles is less than the surface of one of them?

32. Proposed by Artemas Martin, McKean, Erie Co., Pennsylvania.

If three dice be piled up at random on a horizontal plane, what is the probability that the pile will not fall down?

33. Proposed by G. B. Vose, Professor of Mechanics and Civil Engineering, Washington and Jefferson College, Washington, Washington Co., Pa.

An equilateral triangle whose sides are a is placed at random on a larger equilateral triangle whose sides are b. What is the probability that the first triangle will fall entirely within the second?

34. Proposed by S. G. Cagwin, New London, Oneida Co., New York.

Suppose A at the center of a circular field $2a$ rods in diameter, and B on the circumference. B walks round on the circumference at the rate of b miles an hour, and A walks continually towards him at the rate of c miles an hour.

Required—the equation to the *curve* described by A, and the distance he must walk to overtake B.

35. Prize Problem.—Proposed by Artemas Martin, McKean, Erie Co , Pa.

If four pennies be piled up at random on a horizontal plane, what is the probability that the pile will not fall down?

QUERIES.

1. By H. R. Spink, Mason City, Cerro Gordo Co., Iowa.

Why does iron feel colder to the touch in cold weather than wood at the same temperature ;

2. By Artemas Martin, McKean, Erie Co., Pa.

Who was Melchizedek?

3. By W. H. Johnson, Newtown, Bucks Co., Pa.

What periodicals, wholly or in part devoted to Mathematics, have been published in this country during the present century? Give a brief historical account of them.

4. By William Griffith, Fairfield, Huron Co., Ohio.

When and by whom was the Piano-forte invented?

5. By Artemas Martin, McKean, Erie Co., Pa.

How many words in the English language contain all the vowels in their regular order?

6. By H. R. Spink, Mason City, Iowa.

How does a flint "strike fire"? and in what manner does friction produce heat?

7. By William Griffith, Fairfield, Huron Co., Ohio.

Whence the origin of the custom of nailing horse-shoes over the door to prevent witchcraft?

8. By W. H. Johnson, Newtown, Bucks Co., Pa.

When was the State boundary of Pennsylvania extended to its present limits along Lake Erie? Give a brief history of the transaction.

9. By Dr. David S. Hart, Stonington, Conn.

The book of Lamentations has five chapters; the first two and the last two have each 22 verses, and the middle or third chapter has 66, a multiple of 22. Why was this arrangement made?

10. By Artemas Martin, McKean, Erie Co., Pa.

Who wrote the following sonnet?

WASHINGTON.

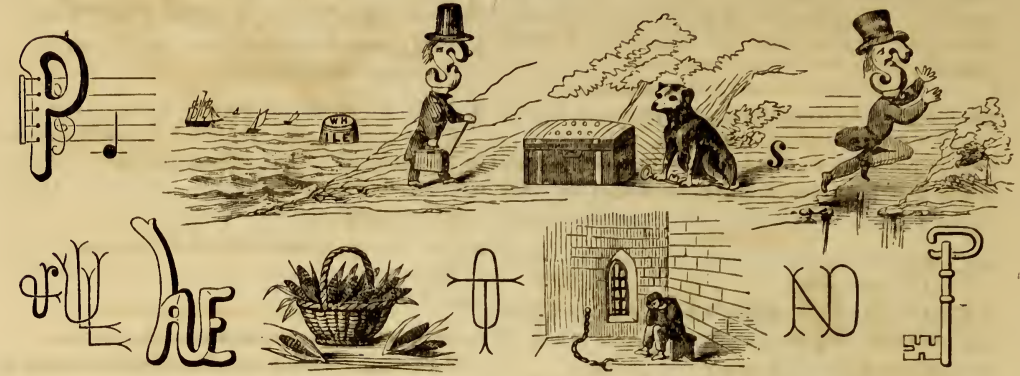
PATER-PATRIÆ.

High over all whom might or mind made great,
Yielding the conqueror's crown to harder hearts:
Exalted not by politician's arts,
Yet with a will to meet and master Fate,
And skill to rule a young, divided State,
Greater by what was *not* than what *was* done,
Alone on History's height stands Washington;
And teeming Time shall not bring forth his mate,
For only *he*, of men, on earth was sent,
In all the might of mind's *integrity;*
Ne'er as in *him*, truth, strength and wisdom blent;
And that his glory might eternal be,
A boundless country is his monument,
A mighty nation, his posterity.

WANTED.—The undersigned desires to procure a copy of Prof. Chas. Gill's "Application of the Angular Analysis to the Solution of Indeterminate Problems of the Second Degree," published in New York about 20 years ago. A liberal price will be paid for a perfect copy in good condition.
ARTEMAS MARTIN, McKean, Erie Co., Pa.

THE PUZZLER'S DEPARTMENT.

1—Rebus.

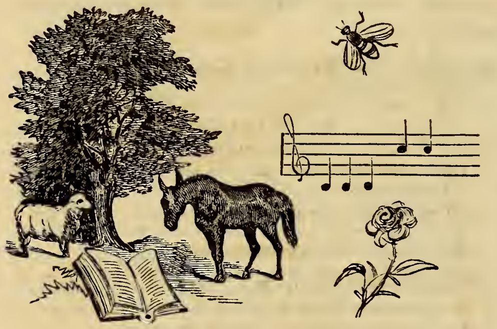


2—Buried Poets.

How swiftly, O ungentle Time,
  Bearing a year upon thy wings,
Thou hast, as some remorseless knight
  Attendant e'er on conquering kings,
With earthquake shock and lightning ray,
On land, on sea, a fell dismay,
Borne all our days and months away.

Up! open for the glad New Year!
  Let echo merrily awake,
And hope will isolate no more,
  But to earth's anthem answer make.
All nature wake at such a time,
Through hill and dale a glorious chime.

3—Rebus.



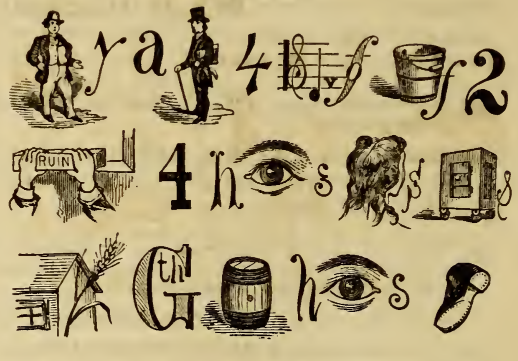
4—Conundrums from Euclid.

1. Why are oysters like plane surfaces?
2. Why is Mary, who has emigrated, like a many-sided figure?
3. Why is a troublesome daughter like a three-sided figure?
4. Why is a chimney pot smoking like a side of a triangle?
5. How would you describe mathematically a man who had been eating onions?

5—A Square Puzzle.

A disagreeable woman. One who governs. An extreme condition. The equivalent of worth. An act of foolish talking.

6—Rebus.



7—Diamond Puzzle.

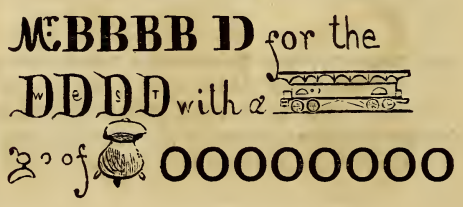
My first is an article; my second is a drink; my third is a place of sacrifice; my fourth is a part of the body; my last is a consonant. The centre letters, read downwards, are the same as my third.

8—Transpositions.

A PASSAGE FROM SHAKSPEARE.

Howeh lysmates rulestpaess suthabrt ewhoh Shrcoemfilf yemm deogamon ebomrs attohf conhtiwh heirmnchiees, kasamend rompeo deined.

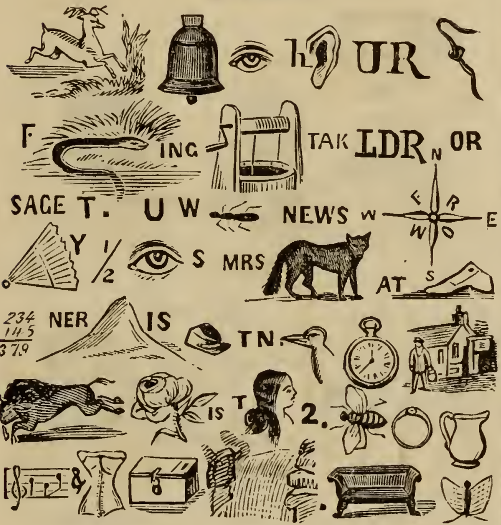
9—Rebus.



10—Enigma.

I dwell in a mansion of stone,
Where sleeping my life I conceal;
Give signs of existence alone
When challenged by weapons of steel.
At first I am humble and small,
Thy breath subdueth my sting,
A rain drop can swallow me all,
But in victory waxeth my wing;
And when my great sister attends me at birth,
I rise the most terrible ruler of earth.

11—Rebus.



12—Anagrams—Geographical Names.

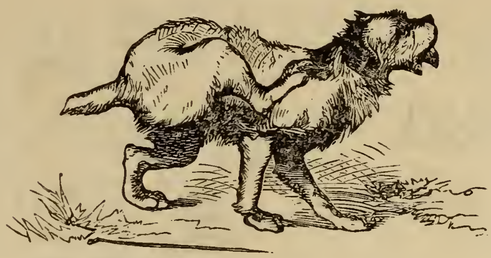
1. Amdien.
2. Onega.
3. Menai.
4. Selma.
5. St. Anne.
6. Nantes.
7. Salem.
8. Maine.
9. Genoa.
10. Medina.

D. LINNE A. TORR.

13—Word Puzzle.

There is a word of four letters containing one vowel, from which *eleven* other words can be made. What is the word, and what are the eleven words that can be made from its letters?

14.—Rebus.



P̈hennomanpursueth.

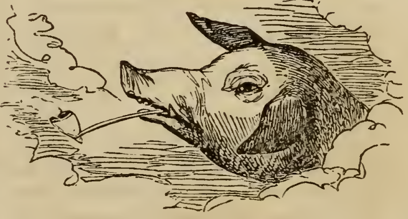
15—Hidden Geographicals.

Fifteen Counties and States, and four Rivers.

'Twas painful to find neither path nor way to guide us. We denied ourselves even to a franc. Every time we started, found us on the path we had before gone. We then embarked in a ship, and were attacked by Japanese pirates. One ball cut my chin away. Oh, I opened my mouth, and cried to the Virgin; I asked her to save us. I relanded and saw some Astrakans as I was walking round, and then I said:—"There is a dogma in every land, on every shore. Can I, O waters of the deep, remain here alone? A man so great—deserted by his comrades. But a hurricane rises, sever now my bonds. Citadel, aware, for now I'm free."

W. H. WATERS.

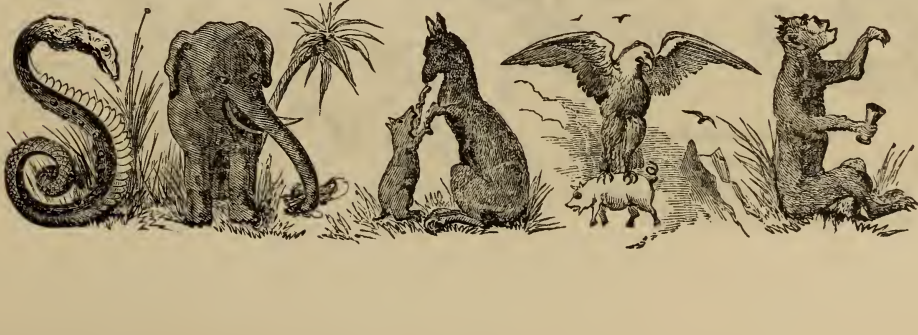
16—Rebus.—Wine Measures.



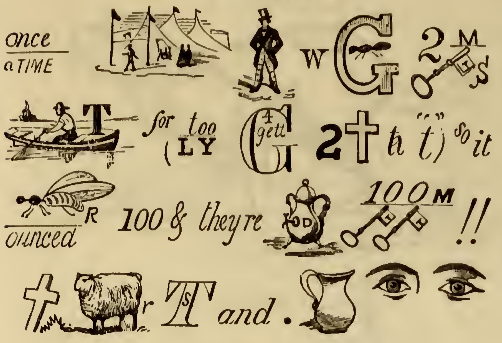
17—Square Word.

Where woman reigns. A shape. A kind of earth. A girl's name.

18—Rebus.



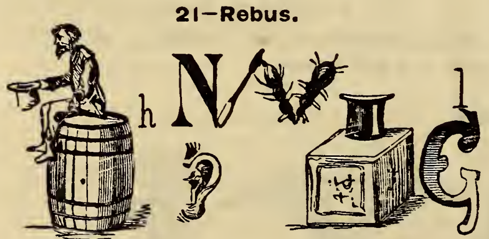
19—Rebus.



20—A Guessing Story.

I am the child of the night and the child of the day. Some dread me, some hate me, some find me a good companion. I have walked for many a mile, but no one ever heard my footfall. Sometimes my master sends me on before him, but as he travels as fast as I do, he sends me back sometimes, and I have to follow in the rear. I have hands and feet, head and shoulders, but no body. It is impossible to estimate my exact height. Nobody has ever looked into my eyes; nobody has ever incurred my anger. I sometimes, in my haste, run over people, and am sometimes trampled under foot by them. When my master writes, I always hold a pen by his side; and when he shaves, I generally take a razor too. I have traveled a good deal, and am very old. When Adam walked in Eden, I, too, was there; and when any new member of Congress goes to the House of Representatives, I nearly always accompany him. Robinson Crusoe was disturbed by my approach when I visited him on the island of Juan Fernandez; and on one occasion I was the means of defeating an army. Although I have no eyes, I could not live without light. I am of very active habits, although I have not in myself either the will or ability to move. Tell me my name.

21—Rebus.



22—Diamond Puzzle.

1. A vowel. 2. Termination. 3. Tranquillity. 4. The same as center. 5. Small openings. 6. To fondle. 7. A consonant.

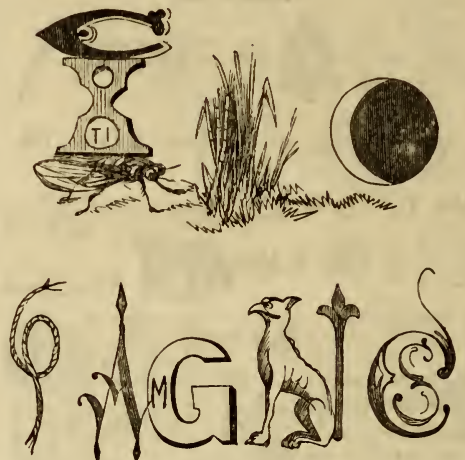
23—Numbered Charade.

I am composed of six letters. My 1, 2, 3, 6, is a generation; 1, 2, 4, 5, is water; 5, 4, 3, 6, is dainty; 5, 6, 2, 1, is at hand; 3, 1, 2, 5, 6, is a bird; 3, 2, 1, 6, is protection; 3, 2, 5, 6, is a stick; 1, 4, 3, 6, is a grain. My whole is a celebrated French poet.

24—Diamond Puzzle.

1. A consonant. 2. A small island in a river. 3. Food. 4. The same as center. 5. A weapon. 6. A dark liquid. 7. A consonant.

25—Rebus.



26—Professors of Sciences (Transposed).

1. I can eat hams, Tim. (Plural.)
2. Last, O Rogers!
3. Go to Gile's.
4. Arm a Popish colt.
5. Sting Lius.
6. I! can 't I hem a mat? (Singular.)

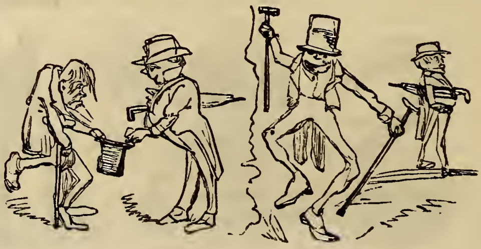
27—Palindromes—Rivers in Europe.

ENIGMATICALLY EXPRESSED.

1. Fish did in Lent.
2. Repair a rent.
3. 'Tis an assent.
4. To try again.
5. A cognomen.
6. The name of men.
7. This is whose toy?
8. It will destroy.
9. A father's joy.

A PAINE TERRE.

28—Charade.



BOOK NOTICES.

First Lessons in Mental and Written Arithmetic. On the Objective Method. Edited by Samuel D. Barr, A.M. pp. 180. *New York: Ivison, Blakeman, Taylor & Co.*

This little book is beautifully illustrated, and is well calculated to fix the attention of young pupils. The method is *objective*, and mental and written work are combined.

The Rudiments of Written Arithmetic: Containing Slate and Black-board Exercises for Beginners, and designed for Graded Schools. Edited by Daniel W. Fish, A.M. pp. 224.

We are told in the preface, "this work has been prepared to meet a limited demand, in large *graded* schools, and in the public schools of New York, and similar cities, where a large number of pupils often obtain but a limited knowledge of arithmetic, and wish to commence its study quite young; and it is also designed for those who desire a larger number of simple and easy exercises for the slate and black-board than are usually found in a complete work on written arithmetic, so that the beginner may acquire facility, promptness, and accuracy in the applications and operations of the fundamental principles of this science."

Robinson's Progressive Practical Arithmetic: Containing the Theory of Numbers, in connection with concise Analytic and Synthetic methods of solution, and designed as a complete text-book on this science, for Common Schools and Academies. By Daniel W. Fish, A.M. 12mo, pp. 372. *New York: Ivison, Blakeman, Taylor & Co.*

In this work the Analytic and Synthetic Methods of solution are both employed. It is very full on Fractions and Percentage, and it contains a large number of well selected "examples for practice."

The Progressive Higher Arithmetic, for Schools, Academies, and Mercantile Colleges. By Horatio N. Robinson, L.L.D. 12mo, pp. 456. *New York: Ivison, Blakeman, Taylor & Co.*

A comprehensive work embracing a wide range of subjects and containing a large number of practical examples.

We quote from the preface: "Much labor and attention have been devoted to obtaining correct and adequate information pertaining to mercantile and commercial transactions, and the Government Standard units of measures, weights, and money. The counting-room, the bank, the insurance and broker's office, the navy and ship yard, the manufactory, the wharves, the custom-house, and the mint have all been visited, and the most reliable statistics and the latest statutes have been consulted, for the purpose of securing *entire accuracy* in those parts of this work which relate to these subjects and departments. As the result of this thorough investigation, many statements found in most other arithmetics of a similar grade will not agree with the facts presented in this work, and simply because the statements in these other books have been copied from older works, while laws and customs have undergone great changes since older works were written. * * * * * The improvements in Percentage made necessary by the financial changes of the last few years are especially noticeable. The different kinds of United States' Securities, Bonds, and Treasury Notes are described, and their comparative value in commercial transactions illustrated by practical examples."

All the above arithmetics except the first contain a full and practical presentation of the Metric System of Weights and Measures.

Davies New Surveying. By Charles Davies, L.L.D. 8vo, sheep, pp. 270–161. Price $2.50. *New York: A. S. Barnes & Co.*, 111 and 113 William Street.

Prof. Davies' Elements of Surveying was first published in 1830, and "was designed as a text-book for the pupils of the Military Academy." Since its first appearance, many changes have been made in order to adapt it more fully to the wants of other institutions, and bring it up with the times. Sections have been added on "Railway Curves," "Section Leveling" and "Mining Engineering." The present edition is, in fact, as its name indicates, really a new work. The plates at the end of the book are very fine. Prof. Davies is a deservedly popular author, and his mathematical works are text-books in many of the leading schools and colleges.

Elements of Mechanics: for the use of Academies, Colleges, and High Schools. By William G. Peck, Professor of Mathematics, Columbia College. 12mo, pp. 344. Price $2.25. *New York: A. S. Barnes & Co.*, 111 and 113 William Street.

As its title indicates, this is an elementary work occupying the middle ground between the simpler and higher treatises, and forms a connecting link between them. It embraces all the important propositions of Elementary Mechanics, logically arranged and rigidly demonstrated. An appendix has been added to the second edition, containing elementary demonstrations of those principles, which in the body of the work are proved by means of the Calculus. Education and science are indebted to Prof. Peck for much valuable labor.

Our Schoolday Visitor. Single copies $1.25 a year; in clubs of three or more, $1.00. *Philadelphia, Pa.: Daughaday & Becker*, 1031 Walnut Street.

This excellent "Young Folks" magazine is steadily advancing in public favor, and has a deservedly high reputation. The Mathematical Department is doing a good work in the cause of mathematical learning. This department is now edited by Artemas Martin. It numbers among its contributors some of the ablest mathematicians in the country.

Weisback's "Elements of Analysis," translated by J. Shenton Zane. 8vo, pp. 79. Printed by King & Baird, Philadelphia, Pa.

The book bearing the above title is a brief treatise on the elements of the Differential and Integral Calculus, designed to accompany the author's "Mechanics of Engineering." The translator deserves the thanks of American students for giving them such an excellent rendering of the celebrated German author. Article 16, page 26, merits particular attention.

Arithmetical Questions for the Recreation of the Teacher and the Discipline of the Pupil. By Rev. U. Jesse Knisely.

The object of this little book is aptly set forth in the title. It contains about 500 questions, and a number of excellent illustrative solutions. We take pleasure in commending it to those in want of such a work.

The Educational Times, and Journal of the College of Preceptors. Published monthly by C. F. Hodgson & Son, 1 Gough Square, E. C., Fleet Street, London, England. Price, to subscribers in the United States, post-paid, 7 shillings a year, (English Money).

This excellent educational periodical contains, in addition to many valuable articles of a scholastic nature, reviews, notices, etc., etc., a most important Mathematical Department under the able editorship of W. J. Miller, B. A., Mathematical Master, Huddersfield College, Yorkshire, devoted to problems, solutions and short mathematical papers, to which many of the leading mathematicians of Europe contribute. Each number contains three or four large double column pages of mathematics. From 20 to 23 problems are proposed each month, and about a dozen solutions are given. The *Times* is, without doubt, the best publication of the kind in the English Language. Every mathematician who desires to keep himself "posted" should subscribe for it at once.

Marks' First Lessons in Geometry. In two parts. Objectively presented, and designed for the use of Primary Classes in Grammar Schools, Academies, &c. By Bernhard Marks, Principal of Lincoln School, San Francisco. 12mo, cloth, pp. 157. *New York: Ivison, Blakeman, Taylor & Co.*

This excellent little work is admirably adapted to the purposes of primary instruction. The second part is beautifully illustrated with colored diagrams, which will not fail to attract the attention of young pupils. The demonstrations are very plain. We heartily commend it to teachers.

A New Manual of the Elements of Astronomy, Descriptive and Mathematical: Comprising the latest Discoveries and Theoretic Views, with Directions for the Use of the Globes and for Studying the Constellations. By Henry Kiddle, A.M., Assistant Superintendent of Schools, New York. 12mo, pp. 284. *New York: Ivison, Blakeman, Taylor & Co.*

The title sufficiently explains the object of this little treatise. The definitions are concise and accurate, the explanations and demonstrations lucid and satisfactory. The computations are simple, and involve only the principles of arithmetic and elementary geometry. It contains the latest discoveries up to 1868. "Brief historical sketches of the various discoveries are given in connection with the facts to which they relate." The engravings are excellent. We consider it a good work on elementary astronomy.

Ray's Analytic Geometry. By George H. Howison, M.A., Professor of Mathematics, Washington University, St. Louis, Mo. 8vo, pp. 574. Price $2.50. *Cincinnati, O.: Wilson, Hinkle & Co.*

The perusal of this book has afforded us much pleasure. It is the *best* American work on the subject of Analytic Geometry that has ever fallen under our notice. The chapter on Trilinear and Tangential Coordinates and Abridged Notation, and the articles on "Polar," "Radical Axis," "Centers of Similitude," "Eccentric Angle," &c, are worthy the careful attention of every student of mathematics. Professor Howison deserves great credit for bringing within the reach of American students, at a moderate cost, the results of the researches of the "great masters."

Mathematical Reprint from the *Educational Times.* 8vo, boards, pp. 112. Issued in half-yearly volumes. Price to subscribers in the United States, post-paid, 6 shillings per volume (English money), singly or by the set. Vols. I to XIII are already published.

These "Reprints" contain, besides the mathematical papers and solutions published in the *Educational Times*, many papers and solutions not given in the *Times.* They should be in the library of every mathematician and professor of mathematics in the land: no mathematical library is complete without them. We have just received Vol. XIII, and consider it one of the most interesting and valuable volumes yet published. This volume contains two elaborate solutions of the following problems proposed by the writer: "Three equal coins are piled at random on a horizontal plane; required the probability that the pile will stand." We will be glad to receive solutions of the above problem for publication in our next number.

The Lady's and Gentleman's Diary. London, England, printed for the Company of Stationers. Price, post-paid, 1 shilling and sevenpence (English money).

The number for 1870 is the 167th annual number. It contains, besides several pages of information of much value to those interested in British history, six interesting queries and the answers to those proposed in the preceding number; also, fifteen excellent mathematical questions and the solutions of the fifteen proposed in the number for 1869. The "Diary" has a very high reputation, and a copy of it should be in the hands of every lover of mathematical science.

The Maine Farmer's Almanac. *Masters, Smith & Co., Holloway, Maine.* Price, post-paid, 12 cents.

The number for 1870 is the fifty second number of this little Annual. It contains, besides other useful information, six mathematical problems and solutions to those proposed in the preceding number. The solution to the sixth problem is not correct; it is a pretty good approximation—nothing more. The true answer is 587.762+ cubic inches.

The Saturday Evening Post. *Henry Peterson & Co., Philadelphia, Pa.* Single copy (with premium steel engraving) $2.50; eight copies (and one extra) $12.00.

This excellent weekly contains novelettes, stories, poetry, wit, humor, &c. One of its distinguishing features is the "Riddler" column, which contains, besides other interesting things, mathematical problems.

Those wanting a good family newspaper can not do better than to subscribe for the Post.

Twilight Stories for the Little Ones. By Mrs. Louise E. Vickroy Boyd. A beautiful and attractive book for Children. 272 pp., handsomely bound and illustrated, gilt back. Price, post-paid. $1.25.

The Adventures of Tom Roper. By S. G. W. Benjamin. A handsome book of 252 pages, bound in fancy cloth and gilt back. With 12 full page illustrations. Price, post-paid, $1.25.

Johnnie Dodge; or, the Freaks and Fortunes of an Idle Boy. By Dr. Charles D. Gardette. Twelve full page illustrations. 16mo, beautifully bound in handsome cloth and gilt back. Price, post-paid, $1.25.

Cruel Jim. A Book for the Young and Old. By Knickerbocker, Jr. Showing that "the way of the transgressor is hard." 260 pp., handsomely bound and illustrated, gilt back. Price, post-paid, $1.25.

Pluck; or, Steps in the Lives of the Keene Family. By Dr. Charles D. Gardette. 270 pp., fourteen illustrations, gilt back. Price, post-paid, $1.25.

These five volumes, all interesting, and of excellent moral tone, are issued from the publishing house of Messrs. Daughaday & Becker, 1031 Walnut street, Philadelphia. They can be had singly, or packed in a neat box, price $6.25, post-paid.

The Wreckmaster. By Knickerbocker, Jr. With six Illustrations. 16mo, pp. 307. Handsomely bound in cloth and gilt. *Philadelphia: Daughaday & Becker*, 1031 Walnut street. Price, post-paid, $1.25.

This little book, just issued from the press, will be found one of the most interesting, exciting, and instructive juveniles yet published. The main object of the author is to illustrate the fearful evils of intemperance, and how it is next to impossible, when once the deadly vice has acquired a hold on its victim, to shake it off. The book is graphically written, and is certain to have a wide circulation.

Schoolday Dialogues. Compiled by Alexander Clark, A.M., late editor of *Our Schoolday Visitor.* Sixth revised and improved edition. New, Original Dialogues, Tableaux, &c. 12mo, 352 pages. *Philadelphia: Daughaday & Becker.* Price, post-paid, $1.50.

This is one of the best and most popular works of the kind ever issued. It deserves to be a text book in our schools, and for school exhibitions it is invaluable.

The Gospel in the Trees. With Pulpit Opinions upon Common Things. By Alexander Clark, A.M. A Book for the People. 12mo, pp. 305. Tinted paper, beveled boards and gilt back. *Philadelphia: Daughaday & Becker.* Price, post-paid, $1.50.

Mr. Clark's popularity as a writer is a sufficient guarantee that whatever emanates from his pen will be gladly received and extensively read.

The Lady Preacher: or, The Life and Labors of Mrs. Hannah Reeves, wife of Rev. William Reeves, D.D. By the Rev. George Brown, D.D. 12mo, pp. 343. Price, post-paid, $1.50. *Philadelphia: Daughaday & Becker.*

An interesting account of the life and labors of an earnest and devoted lady preacher of the gospel.

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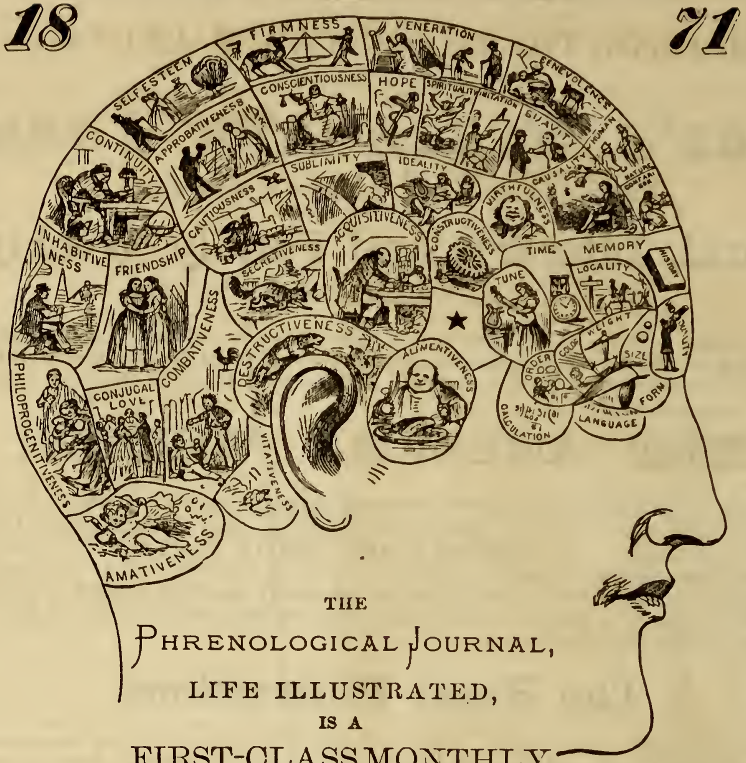

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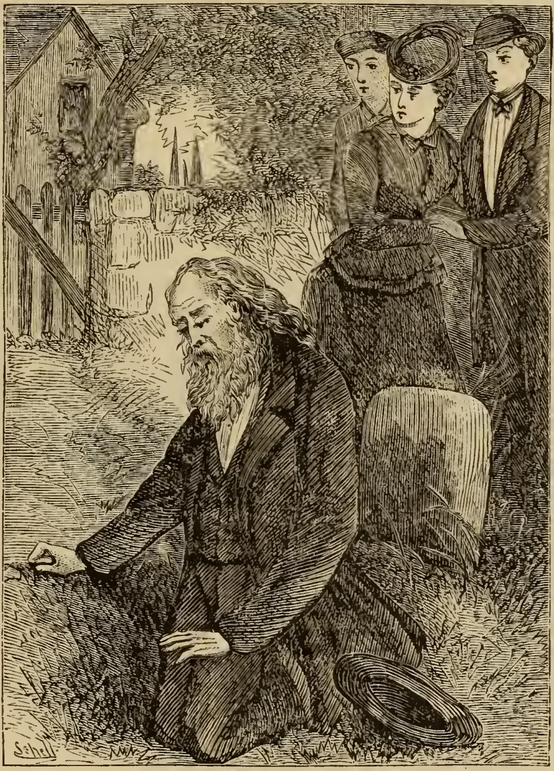

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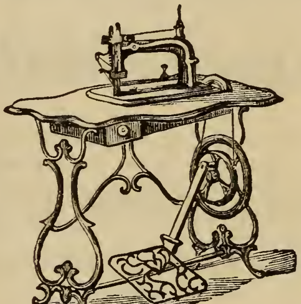

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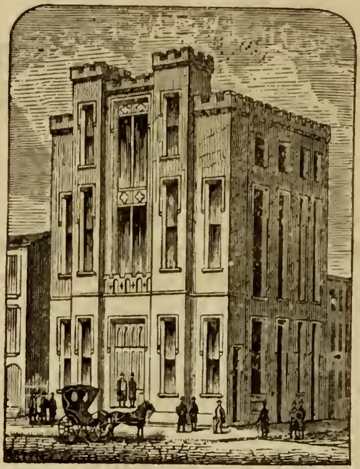

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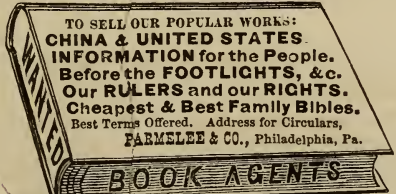

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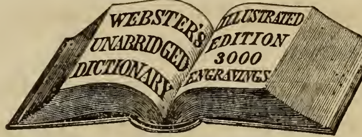

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